Appendix A

Short Description of Routines

Initialization and Introductory Routines

CGMBGD	defines the background colour for CGM files.
CGMPIC	sets the picture ID for CGM files.
DISINI	initializes DISLIN.
ERASE	clears the screen.
ERRDEV	defines the error device.
ERRFIL	sets the name of the error file.
FILBOX	defines the position and size of included metafiles.
HWORIG	defines the origin of the PostScript hardware page.
HWPAGE	defines the size of the PostScript hardware page.
INCFIL	includes metafiles into a graphics.
METAFL	defines the plotfile format.
NEWPAG	creates a new page.
ORIGIN	defines the origin.
PAGE	sets the page size.
PAGERA	plots a page border.
PAGFLL	fills the page with a colour.
PAGHDR	plots a page header.
PAGMOD	selects a page rotation.
PDFMOD	defines compression mode for PDF files.
SCLFAC	defines a scaling factor for the entire plot.
SCLMOD	defines a scaling mode.
SCRMOD	swaps back- and foreground colours.
SETFIL	sets the plotfile name.
SETPAG	selects a predefined page format.
SETXID	defines an external X window or pixmap.
SYMFIL	sends a plotfile to a device.
UNIT	defines the logical unit for messages.

Termination and Parameter Resetting

DISFIN	terminates DISLIN.
ENDGRF	terminates an axis system and sets the level to 1.
RESET	resets parameters to default values.

Plotting Text and Numbers

ANGLE	defines the character angle.
CHAANG	defines an inclination angle for characters.
CHASPC	affects character spacing.
CHAWTH	affects the width of characters.
FIXSPC	sets a constant character width.
FRMESS	defines the thickness of text frames.
HEIGHT	defines the character height.
MESSAG	plots text.
MIXALF	enables control signs in character strings for plotting indices and exponents.
NEWMIX	defines an alternate set of control characters for plotting indices and exponents.
NLMESS	returns the length of character strings in plot coordinates.
NUMBER	plots floating-point numbers.
NUMFMT	determines the format of numbers.
NUMODE	modifies the appearance of numbers.
RLMESS	plots text where the position is specified in user coordinates.
RLNUMB	plots numbers where the position is specified in user coordinates.
SETBAS	determines the position of indices and exponents.
SETEXP	determines the character height of indices and exponents.
SETMIX	defines global control signs for plotting indices and exponents.
TEXMOD	enables TeX mode for plotting mathematical formulas.
TEXOPT	defines TeX options.
TXTJUS	defines the alignment of text and numbers.

Fonts

BASALF	defines the base alphabet.
COMPLX	sets a complex font.
DUPLX	sets a double-stroke font.
DISALF	sets the default font.
EUSHFT	defines a shift character for special European characters.
GOTHIC	sets a gothic font.
HELVE	sets a shaded font.
HELVES	sets a shaded font with small characters.
HWFONT	sets a standard hardware font.
PSFONT	sets a PostScript font.
SERIF	sets a complex shaded font.
SIMPLX	sets a single-stroke font.
SMXALF	defines shift characters for alternate alphabets.
TRIPLX	sets a triple-stroke font.
WINFNT	sets a TrueType font for screen output on Windows 95/NT.
X11FNT	sets an X11 font for screen output on X11 systems.

Symbols

HSYMBL	defines the height of symbols.
RLSYMB	plots symbols where the centre is specified in user coordinates.
SYMBOL	plots symbols.
SYMROT	defines a rotation angle for symbols.

Axis Systems

AX2GRF	suppresses the plotting of the upper X- and the left Y-axis.
AX3LEN	defines axis lengths for a coloured 3-D axis system.
AXGIT	plots the lines X = 0 and Y = 0.
AXSBGD	defines the background colour.
AXSLEN	defines axis lengths for a 2-D axis system.
AXSORG	determines the position of crossed axis systems.
AXSPOS	determines the position of axis systems.
AXSTYP	selects rectangular or crossed axis systems.
BOX2D	plots a border around an axis system.
CENTER	centres axis systems.
CROSS	plots the lines X = 0 and Y = 0 and marks them with ticks.
ENDGRF	terminates an axis system.
FRAME	defines the frame thickness of axis systems.
GRACE	affects the clipping margin of axis systems.
GRAF	plots a two-dimensional axis system.
GRAF3	plots an axis system for colour graphics.
GRDPOL	plos a ploar grid.
GRID	overlays a grid on an axis system.
NOCLIP	suppresses clipping of user coordinates.
NOGRAF	suppresses the plotting of an axis system.
SETGRF	suppresses parts of an axis system.
SETSCL	sets automatic scaling.
TITLE	plots a title over an axis system.
XAXGIT	plots the line Y = 0.
XCROSS	plots the line Y = 0 and marks it with ticks.
YAXGIT	plots the line X = 0.
YCROSS	plots the line X = 0 and marks it with ticks.

Secondary Axes

XAXIS	plots a linear X-axis.
XAXLG	plots a logarithmic X-axis.
YAXIS	plots a linear Y-axis.
YAXLG	plots a logarithmic Y-axis.
ZAXIS	plots a linearly scaled colour bar.
ZAXLG	plots a logarithmically scaled colour bar.

Modification of Axes

AXCLRS	defines colours for axis elements.
AXENDS	suppresses certain labels.
AXSSCL	defines the axis scaling.
HNAME	defines the character height of axis names.
INTAX	defines integer numbering for all axes.
LABDIG	sets the number of decimal places for labels.
LABDIS	sets the distance between labels and ticks.
LABELS	selects labels.
LABJUS	defines the alignment of axis labels.
LABMOD	modifies date labels.
LABPOS	determines the position of labels.
LABTYP	defines vertical or horizontal labels.
LOGTIC	modifies the appearance of logarithmic ticks.

MYLAB	sets user-defined labels.
NAMDIS	sets the distance between axis names and labels.
NAME	defines axis titles.
NAMJUS	defines the alignment of axis titles.
NOLINE	suppresses the plotting of axis lines.
RGTLAB	right-justifies labels.
RVYNAM	defines an angle for Y-axis names.
TICKS	sets the number of ticks.
TICLEN	sets the length of ticks.
TICMOD	modifies the plotting of ticks at calendar axes.
TICPOS	determines the position of ticks.
TIMOPT	modifies time labels.

Axis System Titles

HTITLE	defines the character height of titles.
LFTTIT	left-justifies title lines.
LINESP	defines line spacing.
TITJUS	defines the alignment of titles.
TITLE	plots axis system titles.
TITLIN	defines text lines for titles.
TITPOS	defines the position of titles.
VKYTIT	shifts titles in the vertical direction.

Plotting Data Points

BARS	plots a bar graph.
CHNATT	changes curve attributes.
CHNCRV	defines attributes changed automatically by CURVE.
COLOR	defines the colour used for text and lines.
CRVMAT	plots a coloured surface.
CRVTRI	plots a coloured surface from triangulated data.
CURVE	plots curves.
CURVE3	plots coloured rectangles.
CURVX3	plots rows of coloured rectangles.
CURVY3	plots columns of coloured rectangles.
ERRBAR	plots error bars.
FIELD	plots a vector field.
GAPCRV	defines gaps plotted by CURVE.
INCCRV	defines the number of curves plotted with equal attributes.
INCMRK	selects symbols or lines for CURVE.
MARKER	sets the symbols plotted by CURVE.
NOCHEK	suppresses listing of data points that lie outside of the axis scaling.
PIEGRF	plots a pie chart.
POLCRV	defines the interpolation method used by CURVE.
RESATT	resets curve attributes.
SETRES	sets the size of coloured rectangles.
SHDCRV	plots shaded areas between curves.
SPLMOD	modifies spline interpolation.
THKCRV	defines the thickness of curves.

Legends

FRAME	sets the frame thickness of legends.
LEGEND	plots legends.
LEGINI	initializes legends.
LEGLIN	defines text for legend lines.
LEGOPT	modifies the appearance of legends.
LEGPAT	stores curve attributes.
LEGPOS	determines the position of legends.
LEGTIT	defines the legend title.
LINESP	affects line spacing.
MIXLEG	enables multiple text lines in legends.
NXLEGN	returns the width of legends in plot coordinates.
NYLEGN	returns the height of legends in plot coordinates.

Line Styles and Shading Patterns

CHNDOT	sets a dotted-dashed line style.
CHNDSH	sets a dashed-dotted line style.
COLOR	sets a colour.
DASH	sets a dashed line style.
DASHL	sets a long-dashed line style.
DASHM	sets a medium-dashed line style.
DOT	sets a dotted line style.
DOTL	sets a long-dotted line style.
LINTYP	defines a line style.
LINWID	sets the line width.
LNCAP	sets the line cap parameter.
LNJOIN	sets the line join parameter.
LNMLT	sets the miter limit parameter.
MYLINE	sets a user-defined line style.
MYPAT	defines a global shading pattern.
PENWID	sets the pen width.
SHDPAT	selects a shading pattern.
SOLID	sets a solid line style.

Cycles

CLRCYC	modifies the colour cycle.
LINCYC	modifies the line style cycle.
PATCYC	modifies the pattern cycle.

Base Transformations

TRFRES	resets base transformations.
TRFROT	affects the rotation of plot vectors.
TRFSCL	affects the scaling of plot vectors.
TRFSHF	affects the shifting of plot vectors.

Shielding

SHIELD	defines automatic shielding.
SHLCIR	defines circles as shielded areas.
SHLDEL	deletes shielded areas.
SHLELL	defines ellipses as shielded areas.
SHLIND	returns the index of a shielded area.
SHLPIE	defines pie segments as shielded areas.
SHLPOL	defines polygons as shielded areas.
SHLRCT	defines rotated rectangles as shielded areas.
SHLREC	defines rectangles as shielded areas.
SHLRES	deletes shielded areas.
SHLVIS	enables or disables shielded areas.

Parameter Requesting Routines

GETALF	returns the base alphabet.
GETANG	returns the current angle used for text and numbers.
GETCLP	returns the currents clipping window.
GETCLR	returns the current colour number.
GETDIG	returns the number of decimal places used in labels.
GETDSP	returns the terminal type.
GETFIL	returns the current plotfile name.
GETGRF	returns the scaling of the current axis system.
GETHGT	returns the current character height.
GETIND	returns the RGB coordinates for a colour index.
GETLAB	returns the current labels.
GETLEN	returns the current axis lengths.
GETLEV	returns the current level.
GETLIN	returns the current line width.
GETMFL	returns the current file format.
GETMIX	returns shift characters defined for indices and exponents.
GETOR	returns the current origin.
GETPAG	returns the current page size.
GETPAT	returns the current shading pattern.
GETPLV	returns the patchlevel of the current DISLIN library.
GETPOS	returns the position of the axis system.
GETRAN	returns the range of colour bars.
GETRES	returns the size of points used in 3-D colour graphics.
GETRGB	returns the RGB coordinates of the current colour.
GETSCL	returns the current axis scaling.
GETSCR	returns the screen size in pixels.
GETSHF	returns the control character used for European characters.
GETSP1	returns the distance between axis ticks and labels.
GETSP2	returns the distance between axis labels and names.
GETSYM	returns the current symbol number and height.
GETTCL	returns the current tick lengths.
GETTIC	returns the number of ticks plotted between labels.
GETTYP	returns the current line style.
GETUNI	returns the current unit used for messages.
GETVER	returns the version number of the currently used DISLIN library.
GETVK	returns the current lengths used for shifting.
GETVLT	returns the current colour table.

GETWID	returns the width of colour bars.
GETWIN	returns the position and size of the graphics window.
GETXID	returns the X window ID.
GMXALF	returns shift characters for alphabets.

Elementary Plot Routines

ARCELL	plots elliptical arcs.
AREAF	plots polygons.
CIRCLE	plots circles.
CONNPT	plots a line to a point.
ELLIPS	plots ellipses.
LINE	plots lines.
NOARLN	suppresses the outline of geometric figures.
PIE	plots pie segments.
POINT	plots coloured rectangles where the position is defined by the centre point.
RECFLL	plots coloured rectangles.
RECTAN	plots rectangles.
RNDREC	plots a rectangle with rounded corners.
RLARC	plots elliptical arcs for user coordinates.
RLAREA	plots polygons for user coordinates.
RLCIRC	plots circles for user coordinates.
RLCONN	plots a line to a point (user coordinates).
RLELL	plots ellipses for user coordinates.
RLINE	plots lines for user coordinates.
RLPIE	plots pie segments for user coordinates.
RLPOIN	plots coloured rectangles for user coordinates.
RLREC	plots rectangles for user coordinates.
RLRND	plots for user coordinates a rectangle with rounded corners.
RLSEC	plots coloured pie sectors for user coordinates.
RLSTRT	moves the pen to a point (user coordinates).
RLVEC	plots vectors for user coordinates.
SECTOR	plots coloured pie sectors.
STRTPT	moves the pen to a point.
VECTOR	plots vectors.
XMOVE	moves the pen to a point.
XDRAW	plots a line to a point.

Conversion of Coordinates

COLRAY	converts Z-coordinates to colour numbers.
NXPOSN	converts X-coordinates to plot coordinates.
NYPOSN	converts Y-coordinates to plot coordinates.
NZPOSN	converts Z-coordinates to colour numbers.
TRFCO1	converts one-dimensional coordinates.
TRFCO2	converts two-dimensional coordinates.
TRFCO3	converts three-dimensional coordinates.
TRFREL	converts X- and Y-coordinates to plot coordinates.
XINVRS	converts X plot coordinates to user coordinates.
XPOSN	converts X-coordinates to real plot coordinates.
YINVRS	converts Y plot coordinates to user coordinates.
YPOSN	converts Y-coordinates to real plot coordinates.

Utility Routines

BEZIER	calculates a Bezier interpolation.
BITSI2	allows bit manipulation on 16 bit variables.
BITSI4	allows bit manipulation on 32 bit variables.
CIRC3P	calculates a circle specified by three points.
FCHA	converts floating-point numbers to character strings.
FLEN	calculates the number of digits for floating-point numbers.
HISTOG	calculates a histogram.
INTCHA	converts integers to character strings.
INTLEN	calculates the number of digits for integers.
NLMESS	returns the length of character strings in plot coordinates.
NLNUMB	returns the length of numbers in plot coordinates.
SORTR1	sorts floating-point numbers.
SORTR2	sorts points in the X-direction.
SPLINE	returns splined points as calculated in CURVE.
SWAPI2	swaps the bytes of 16 bit variables.
SWAPI4	swaps the bytes of 32 bit variables.
TRIANG	calculates the Delaunay triangulation.
TRMLEN	calculates the number of characters in character strings.
UPSTR	converts a character string to uppercase letters.

Binary File I/O

CLOSFL	closes a file.
OPENFL	opens a file for binary I/O.
POSIFL	skips to a certain position relative to the start.
READFL	reads a given number of bytes.
SKIPFL	skips a number of bytes from the current position.
TELLFL	returns the file position.
WRITFL	writes a given number of bytes.

Date Routines

BASDAT	defines the base date.
INCDAT	calculates incremented days.
NWKDAY	returns the weekday for a date.
TRFDAT	converts incremented days to a date.

Cursor Routines

CSRMOV	returns collected cursor movements.
CSRPT1	returns a pressed cursor position.
CSRPTS	returns collected cursor positions.
CSRUNI	defines the unit returned cursor routines.

Bar Graphs

BARBOR	defines the colour of bar borders.
BARCLR	defines the colours of bars.
BARGRP	affects clustered bars.
BARMOD	selects fixed or variable bars.
BAROPT	sets parameters for 3-D bars.
BARPOS	selects predefined positions for bars.
BARS	plots bar graphs.
BARTYP	selects vertical or horizontal bars.
LABCLR	defines the colour of bar labels.
LABDIG	defines the number of decimal places in bar labels.
LABELS	defines bar labels.
LABPOS	defines the position of bar labels.

Pie Charts

CHNPIE	defines colour and pattern attributes for pie segments.
LABCLR	defines the colour of segment labels.
LABDIG	defines the number of decimal places in segment labels.
LABELS	defines pie labels.
LABPOS	defines the position of segment labels.
LABTYP	modifies the appearance of segment labels.
PIEBOR	defines the colour of pie borders.
PIECLR	defines pie colours.
PIEEXP	defines exploded pie segments.
PIEGRF	plots pie charts.
PIELAB	sets additional character strings plotted in segment labels.
PIEOPT	sets parameters for 3-D pie charts.
PIETYP	selects 2-D or 3-D pie charts.
PIEVEC	modifies the arrow plotted between labels and segments.
USRPIE	is a user-defined subroutine to modify pie charts.

Coloured 3-D Graphics

AX3LEN	defines axis lengths.
COLOR	defines colours.
COLRAN	defines the range of colour bars.
CRVMAT	plots a coloured surface.
CRVTRI	plots a coloured surface from triangulated data..
CURVE3	plots coloured rectangles.
CURVX3	plots rows of coloured rectangles.
CURVY3	plots columns of coloured rectangles.
ERASE	erases the screen.
GRAF3	plots a coloured axis system.
HSVRGB	converts HSV to RGB coordinates.
MYVLT	changes the current colour table.
NOBAR	suppresses the plotting of colour bars.
NOBGD	suppresses the plotting of points which have the same colour as the background.
NZPOSN	converts a Z-coordinate to a colour number.
POINT	plots coloured rectangles.
RECFLL	plots coloured rectangles.
RGBHSV	converts RGB to HSV coordinates.

RLPOIN	plots coloured rectangles for user coordinates where the position is defined by the centre point.
RLSEC	plots coloured pie sectors for user coordinates.
SECTOR	plots coloured pie sectors.
SETCLR	defines colours.
SETIND	changes the current colour table.
SETRES	defines the size of coloured rectangles.
SETRGB	defines colours.
SETVLT	selects a colour table.
VKXBAR	shifts colour bars in the X-direction.
VKYBAR	shifts colour bars in the Y-direction.
WIDBAR	defines the width of colour bars.
ZAXIS	plots linearly scaled colour bars.
ZAXLG	plots logarithmically scaled colour bars.

3-D Graphics

ABS3PT	converts absolute 3-D coordinates to plot coordinates.
AXIS3D	defines the lengths of the 3-D box.
BOX3D	plots a border around the 3-D box.
CONN3D	plots a line to a point in 3-D space.
CURV3D	plots curves or symbols.
FLAB3D	disables the suppression of axis labels.
GETLIT	calculates colour values.
GETMAT	calculates a function matrix from randomly distributed data points.
GRAF3D	plots an axis system.
GRFFIN	terminates a projection into 3-D space.
GRFINI	initializes projections in 3-D space.
GRID3D	plots a grid.
LIGHT	turns lighting on or off.
LITMOD	turns single light sources on or off.
LITOPT	modifies light parameters.
LITPOS	sets the position of light sources.
MATOPT	modifies material parameters.
MDFMAT	modifies the algorithm used in GETMAT.
MSHCLR	defines the colour of surface meshes.
NOHIDE	disables the hidden-line algorithm.
POS3PT	converts user coordinates to absolute 3-D coordinates.
REL3PT	converts user coordinates to plot coordinates.
SHDMOD	defines flat or smooth shading for surfaces.
SHLSUR	protects surfaces from overwriting.
SPHE3D	plots a sphere.
STRT3D	moves the pen to a point.
SURCLR	selects surface colours.
SURFCE	plots the surface of a function matrix.
SURFCP	plots a shaded surface of a parametric function.
SURFUN	plots the surface of the function $Z = F(X,Y)$.
SURISO	plots isosurfaces.
SURMAT	plots the surface of a function matrix.
SURMSH	enables grid lines.
SUROPT	suppresses surfaces lines plotted by SURFCE.
SURSHD	plots a coloured surface.

SURTRI	plots a coloured surface from triangulated data.
SURVIS	determines the visible part of surfaces.
VANG3D	defines the field of view.
VECTR3	plots vectors in 3-D space.
VFOC3D	defines the focus point.
VIEW3D	defines the viewpoint.
VUP3D	defines the camera orientation.
ZBFFIN	terminates the Z-buffer.
ZBFINI	allocates space for a Z-buffer.
ZBFLIN	plots lines.
ZBFTRI	plots triangles.
ZSCALE	defines a Z-scaling for coloured surfaces.

Geographical Projections

CURVMP	plots curves or symbols.
GRAFMP	plots a geographical axis system.
GRIDMP	plots a grid.
MAPBAS	defines a base map.
MAPLEV	specifies land or lake plotting.
MAPMOD	modifies the connection of points used in CURVMP.
MAPPOL	defines the map pole used for azimuthal projections.
MAPREF	defines two latitudes used for conical projections.
POS2PT	converts user coordinates to plot coordinates.
PROJCT	selects a projection.
SHDEUR	shades European countries.
SHDMAP	shades continents.
WORLD	plots coastlines and lakes.
XAXMAP	plots a secondary X-axis.
YAXMAP	plots a secondary Y-axis.

Contouring

CONCLR	defines colours fro filled contours.
CONCRV	plots generated contours.
CONGAP	affects the spacing between contour lines and labels.
CONLAB	defines a character string used for contour labels.
CONMAT	plots contours.
CONMOD	affects the position of contour labels.
CONPTS	generates contours.
CONSHD	plots shaded contours.
CONTRI	plots contours from triangulated data.
CONTUR	plots contours.
LABCLR	defines the colour of contour labels.
LABDIS	defines the distance between labels.
LABELS	defines contour labels.
SHDMOD	sets the algorithm for shaded contours.

Image Routines

IMGINI	initializes transfering of image data.
IMGFIN	terminates transfering of image data.
RBFPNG	stores an image as PNG file in a buffer.
RIMAGE	copies an image from memory to a file.
RPIXEL	reads a pixel from memory.
RPIXLS	reads image data from memory.
RPNG	stores an image as a PNG file.
RPPM	stores an image as a PPM file.
RPXROW	reads a row of image data from memory.
RTIFF	stores an image as a TIFF file.
TIFORG	defines the position of TIFF files copied with WTIFF.
TIFWIN	defines a clipping window for TIFF files copied with WTIFF.
WIMAGE	copies an image from file to memory.
WPIXEL	writes a pixel to memory.
WPIXLS	writes image data to memory.
WPXROW	write a row of image data to memory.
WTIFF	copies a TIFF file created by DISLIN to memory.

Window Routines

CLSWIN	closes a window.
OPNWIN	opens a window for graphics output.
SELWIN	selects a window for graphics output.
WINAPP	defines a window or console application.
WINDOW	defines the position and size of windows.
WINID	returns the ID of the currently selected window.
WINKEY	defines a key that can be used for program continuation in DISFIN.
WINMOD	affects the handling of windows in the termination routine DISFIN.
WINSIZ	defines the size of windows.
WINTIT	sets the title of the currently selected window.

Widget Routines

DWGBUT	displays a message that can be answered with 'Yes' or 'No'.
DWGFIL	creates a file selection box.
DWGLIS	gets a selection from a list of items.
DWGMSG	displays a message.
DWGTXT	prompts an user for input.
GWGATT	requests a widget attribute.
GWGBOX	requests the value of a box widget.
GWGBUT	requests the status of a button widget.
GWGFIL	requests the value of a file widget.
GWGLIS	requests the value of a list widget.
GWGSCL	requests the value of a scale widget.
GWGTXT	requests the value of a text widget.
GWGXID	returns the window ID for a widget.
ITMCAT	concatenates an element to a list string.
ITMCNT	calculates the number of elements in a list string.
ITMSTR	extracts an element from a list string.
MSGBOX	prints a message.
SWGATT	sets widget attributes.
SWGBOX	changes the selection of a box widget.

SWGBUT	changes the status of a button widget.
SWGCBK	connects a widget with a callback routine.
SWGDRW	defines the height of draw widgets.
SWGFIL	changes the value of a file widget.
SWGFNT	sets fonts for widgets.
SWGHLP	sets a character string that will be displayed if the Help menu is clicked.
SWGJUS	defines the alignment of label widgets.
SWGLIS	changes the selection of a list widget.
SWGMIX	defines control characters.
SWGMRG	defines widget margins.
SWGOPT	sets a center option for the parent widget.
SWGPOP	modifies the appearance of the popup menubar.
SWGPOS	defines the position of widgets.
SWGSCL	changes the value of a scale widget.
SWGSIZ	defines the size of widgets.
SWGSPC	modifies the space between widgets.
SWGSTP	defines a step value for scale widgets.
SWGTIT	sets a title for the main widget.
SWGTXT	changes the value of a text widget.
SWGTYP	modifies the appearance of widgets.
SWGWIN	defines the position and size of widgets.
SWGWTH	sets the default width of widgets.
WGAPP	creates an entry in a popup menu.
WGBAS	creates a container wdiget.
WGBOX	creates a list widget where the list elements are displayed as toggle buttons.
WGBUT	creates a button widget.
WGCMD	creates a command widget.
WGDLIS	creates a dropping list widget.
WGDRAW	creates a draw widget.
WGFIL	creates a file widget.
WGFIN	terminates widget routines.
WGINI	creates a main widget and initalizes widget routines.
WGLAB	creates a label widget.
WGLIS	creates a list widget.
WGLTXT	creates a labeled text widget.
WGOK	creates a OK push button widget.
WGPBUT	creates a push button widget.
WGPOP	creates a popup menu.
WGQUIT	creates a QUIT push button widget.
WGSCL	creates a scale widget.
WGTXT	creates a text widget.

Quickplots

QPLBAR	plots a bar graph.
QPLCLR	plots a colour surface of a matrix.
QPLCON	plots a contour lines of a matrix.
QPLPIE	plots a pie chart.
QPLOT	makes a curve plot.
QPLSCA	makes a scatter plot.
QPLSUR	plots a surface of a matrix.

MPAe Emblem

MPAEPL	plots the MPAe emblem.
MPLANG	defines a rotation angle for the MPAe emblem.
MPLCLR	defines the fore- and background colours of the MPAe emblem.
MPLPOS	defines the position of the MPAe emblem.
MPLSIZ	defines the size of the MPAe emblem.
NOFILL	suppresses the shading of the MPAe emblem.

Appendix B

Examples

B.1   Demonstration of CURVE

```fortran
      PROGRAM EXA_1
C     USE DISLIN          for Fortran 90!
      PARAMETER (N=301)
      DIMENSION XRAY(N),Y1RAY(N),Y2RAY(N)

      PI=3.1415926
      FPI=PI/180.
      STEP=360./(N-1)

      DO I=1,N
        XRAY(I)=(I-1)*STEP
        X=XRAY(I)*FPI
        Y1RAY(I)=SIN(X)
        Y2RAY(I)=COS(X)
      END DO

      CALL DISINI
      CALL PAGERA
      CALL COMPLX

      CALL AXSPOS(450,1800)
      CALL AXSLEN(2200,1200)

      CALL NAME('X-axis','X')
      CALL NAME('Y-axis','Y')

      CALL LABDIG(-1,'X')
      CALL TICKS(10,'XY')

      CALL TITLIN('Demonstration of CURVE',1)
      CALL TITLIN('SIN(X), COS(X)',3)

      CALL GRAF(0.,360.,0.,90.,-1.,1.,-1.,0.5)
      CALL TITLE

      CALL CURVE(XRAY,Y1RAY,N)
      CALL CURVE(XRAY,Y2RAY,N)

      CALL DASH
      CALL XAXGIT

      CALL DISFIN
      END
```

Demonstration of CURVE

SIN(X), COS(X)
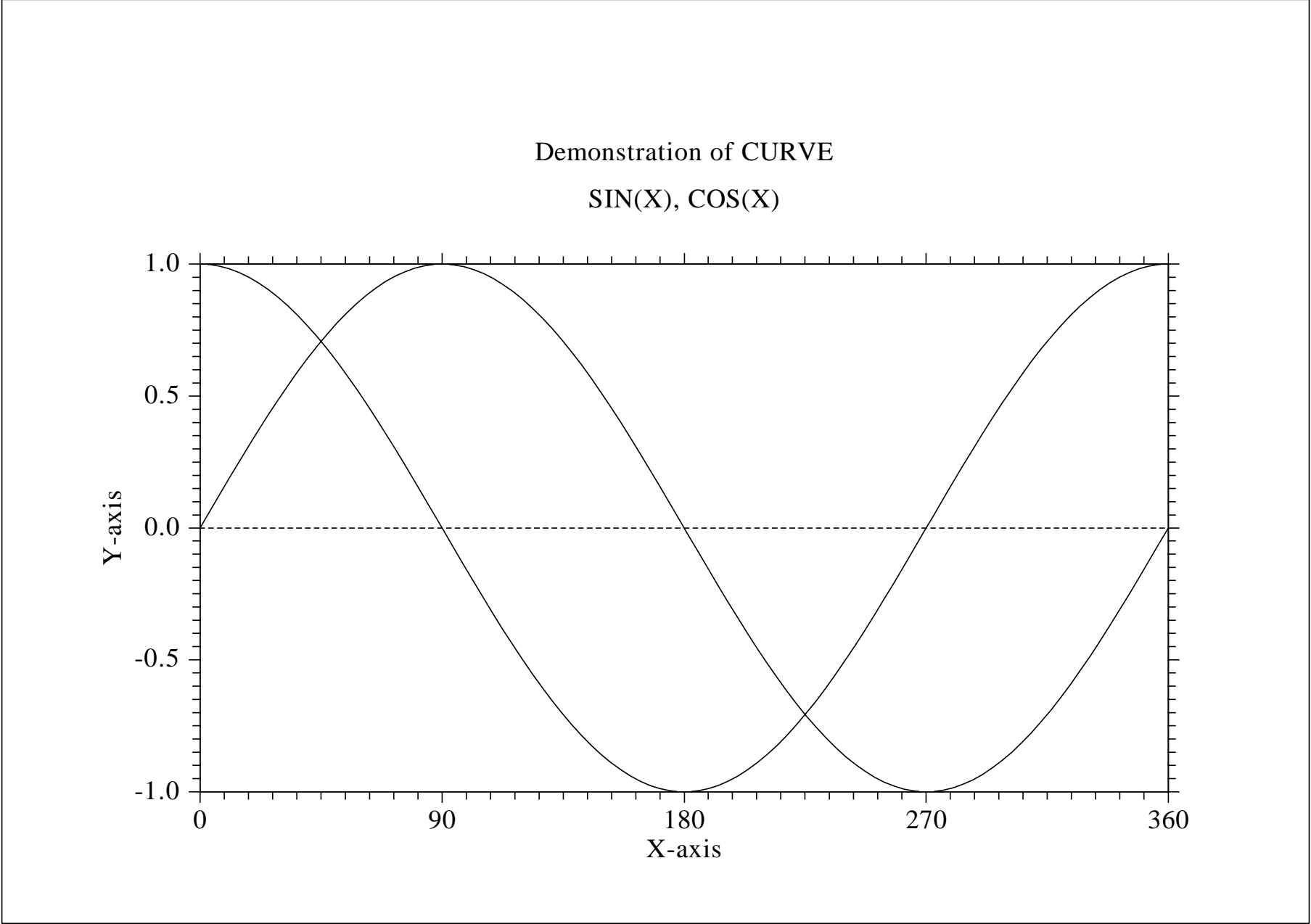
Figure B.1: Demonstration of CURVE

B.2 Symbols

```
       PROGRAM EXA_2
C      USE DISLIN          for Fortran 90!
       CHARACTER*20 CTIT,CSTR*2
       CTIT='Symbols'

       CALL SETPAG('DA4P')
       CALL DISINI
       CALL COMPLX
       CALL PAGERA
       CALL PAGHDR('H. Michels  (',')',2,0)

       CALL HEIGHT(60)

       NL=NLMESS(CTIT)
       CALL MESSAG(CTIT,(2100-NL)/2,200)

       CALL HEIGHT(50)
       CALL HSYMBL(120)

       NY=150

       DO I=0,21
         IF(MOD(I,4).EQ.0) THEN
           NY=NY+400
           NXP=550
         ELSE
           NXP=NXP+350
         END IF

         IF(I.LT.10) THEN
           WRITE(CSTR,'(I1)') I
         ELSE
           WRITE(CSTR,'(I2)') I
         END IF

         NL=NLMESS(CSTR)/2
         CALL MESSAG(CSTR,NXP-NL,NY+150)
         CALL SYMBOL(I,NXP,NY)
       END DO

       CALL DISFIN
       END
```

Symbols

Figure B.2: Symbols

B.3 Logarithmic Scaling

```fortran
      PROGRAM EXA_3
C     USE DISLIN          for Fortran 90!
      CHARACTER*60 CTIT,CLAB(3)*5
      DATA CLAB/'LOG','FLOAT','ELOG '/

      CTIT='Logarithmic Scaling'

      CALL SETPAG('DA4P')
      CALL DISINI
      CALL PAGERA
      CALL COMPLX
      CALL AXSLEN(1400,500)

      CALL NAME('X-axis','X')
      CALL NAME('Y-axis','Y')
      CALL AXSSCL('LOG','XY')

      CALL TITLIN(CTIT,2)

      DO I=1,3
        NYA=2650-(I-1)*800
        CALL LABDIG(-1,'XY')
        IF(I.EQ.2)THEN
          CALL LABDIG(1,'Y')
          CALL NAME(' ','X')
        END IF

        CALL AXSPOS(500,NYA)
        CALL MESSAG('Labels: '//CLAB(I),600,NYA-400)
        CALL LABELS(CLAB(I),'XY')
        CALL GRAF(0.,3.,0.,1.,-1.,2.,-1.,1.)

        IF(I.EQ.3) THEN
          CALL HEIGHT(50)
          CALL TITLE
        END IF

        CALL ENDGRF
      END DO

      CALL DISFIN
      END
```

Logarithmic Scaling

Labels: ELOG

Y-axis

Labels: FLOAT

Y-axis

Labels: LOG

Y-axis

X-axis
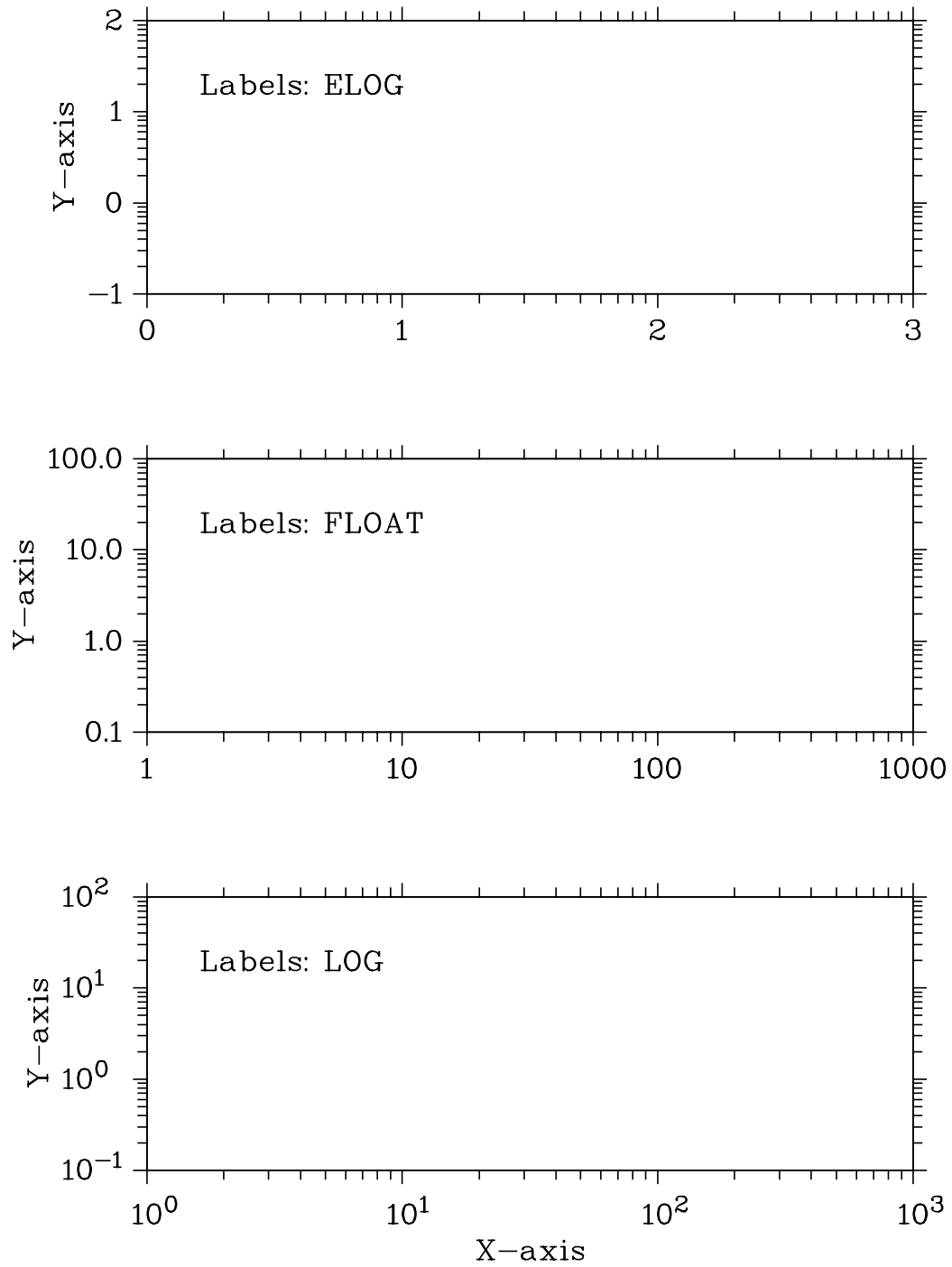
Figure B.3: Logarithmic Scaling

B.4 Interpolation Methods

```fortran
      PROGRAM EXA_4
C     USE DISLIN          for Fortran 90!
      DIMENSION X(16), Y(16)
      CHARACTER*8 CPOL(6),CTIT*60

      DATA X/0.,1.,3.,4.5,6.,8.,9.,11.,12.,12.5,13.,
     *       15.,16.,17.,19.,20./,
     * Y/2.,4.,4.5,3.,1.,7.,2.,3.,5.,2.,2.5,2.,4.,6.,
     *    5.5,4./,
     * CPOL/'SPLINE','STEM','BARS','STAIRS','STEP,'LINEAR'/
     * NYA/2700/

      CTIT='Interpolation Methods'

      CALL SETPAG('DA4P')
      CALL DISINI
      CALL PAGERA
      CALL COMPLX
      CALL INCMRK(1)
      CALL HSYMBL(25)
      CALL TITLIN(CTIT,1)
      CALL AXSLEN(1500,350)
      CALL SETGRF('LINE','LINE','LINE','LINE')

      DO I=1,6
        CALL AXSPOS(350,NYA-(I-1)*350)
        CALL POLCRV(CPOL(I))
        CALL MARKER(0)

        CALL GRAF(0.,20.,0.,5.,0.,10.,0.,5.)
        NX=NXPOSN(1.)
        NY=NYPOSN(8.)
        CALL MESSAG(CPOL(I),NX,NY)
        CALL CURVE(X,Y,16)

        IF(I.EQ.6) THEN
          CALL HEIGHT(50)
          CALL TITLE
        END IF
        CALL ENDGRF
      END DO

      CALL DISFIN
      END
```

Interpolation Methods

LINEAR

STEP

STAIRS

BARS

STEM

SPLINE
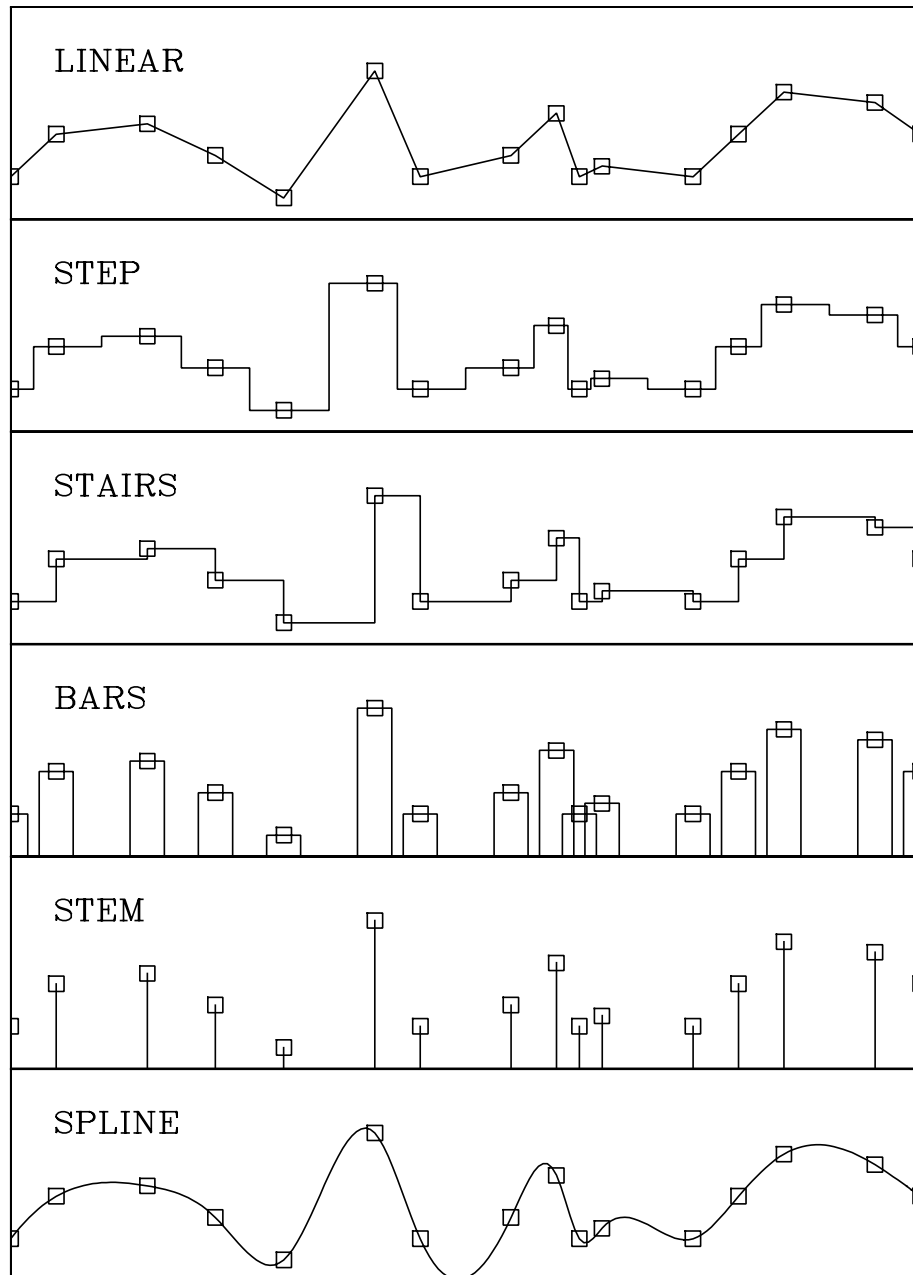
Figure B.4: Interpolation Methods

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B.5 Line Styles

```
      PROGRAM EXA_5
 C    USE DISLIN         for Fortran 90!
      DIMENSION X(2),Y(2)
      CHARACTER*6 CTYP(8)
      DATA X/3.,9./CTYP/'SOLID','DOT','DASH','CHNDSH',
*                      'CHNDOT','DASHM','DOTL','DASHL'/

      CALL SETPAG('DA4P')
      CALL DISINI
      CALL PAGERA
      CALL COMPLX
      CALL CENTER
      CALL CHNCRV('LINE')

      CALL NAME('X-axis','X')
      CALL NAME('Y-axis','Y')

      CALL TITLIN('Demonstration of CURVE',1)
      CALL TITLIN('Line Styles',3)

      CALL GRAF(0.,10.,0.,2.,0.,10.,0.,2.)
      CALL TITLE

      DO I=1,8
        Y(1)=9.5-I
        Y(2)=9.5-I
        NY=NYPOSN(Y(1))
        NX=NXPOSN(1.0)
        CALL MESSAG(CTYP(I),NX,NY-20)
        CALL CURVE(X,Y,2)
      END DO

      CALL DISFIN
      END
```
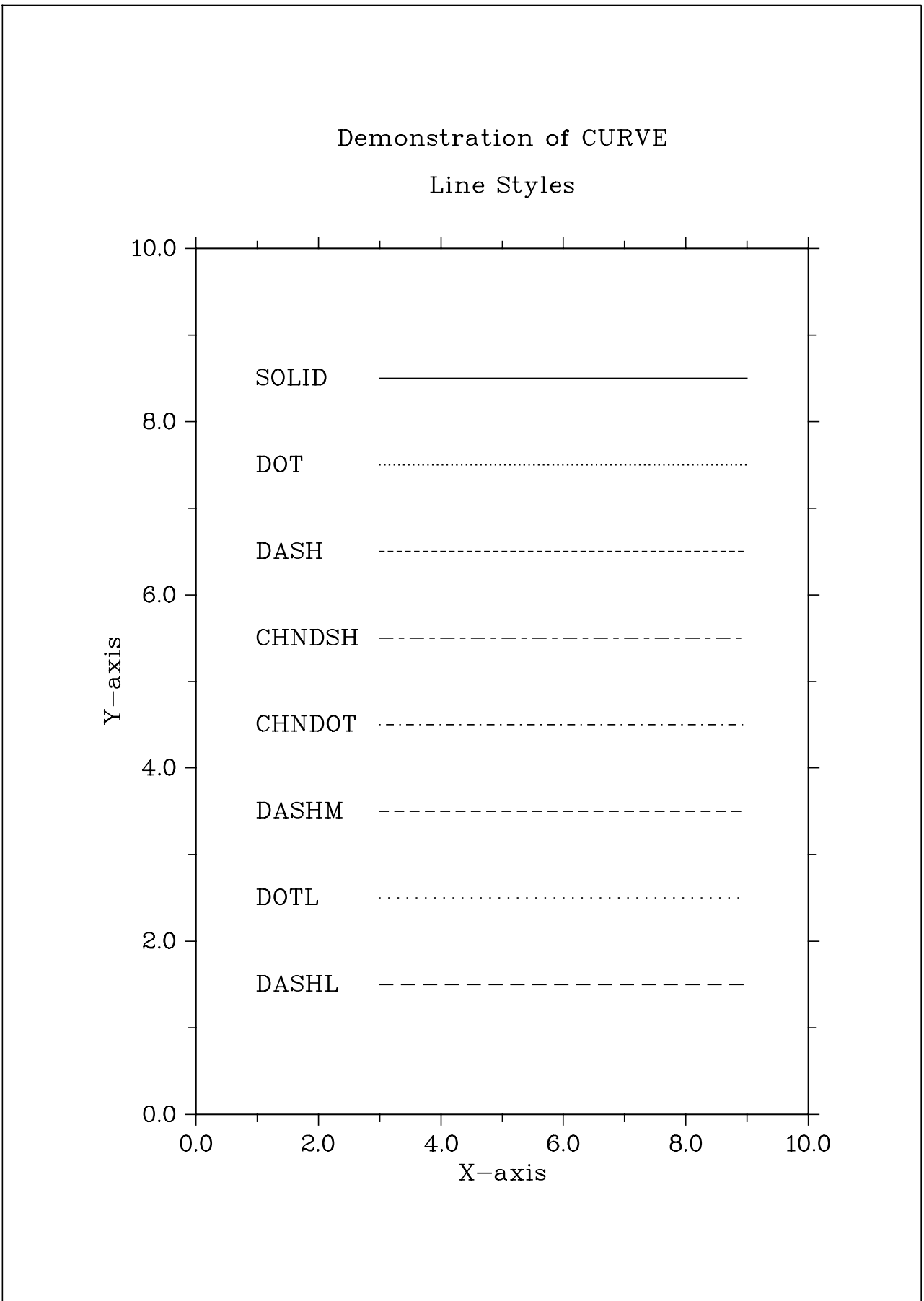
Figure B.5: Line Styles

B.6 Legends

```
      PROGRAM EXA_6
C     USE DISLIN          for Fortran 90!
      PARAMETER(N=301)
      DIMENSION XRAY(N),Y1RAY(N),Y2RAY(N)
      CHARACTER*14 CBUF

      FPI=3.1415926/180.
      STEP=360./(N-1)
      DO I=1,N
        XRAY(I)=(I-1)*STEP
        X=XRAY(I)*FPI
        Y1RAY(I)=SIN(X)
        Y2RAY(I)=COS(X)
      END DO

      CALL DISINI
      CALL PAGERA
      CALL COMPLX
      CALL AXSPOS(450,1800)
      CALL AXSLEN(2200,1200)

      CALL NAME('X-axis','X')
      CALL NAME('Y-axis','Y')
      CALL TITLIN('Demonstration of CURVE',1)
      CALL TITLIN('Legend',3)
      CALL LABDIG(-1,'X')
      CALL TICKS(10,'XY')

      CALL GRAF(0.,360.,0.,90.,-1.,1.,-1.,0.5)
      CALL TITLE
      CALL XAXGIT

      CALL CHNCRV('LINE')
      CALL CURVE(XRAY,Y1RAY,N)
      CALL CURVE(XRAY,Y2RAY,N)

      CALL LEGINI(CBUF,2,7)      ! Legend statements
      NX=NXPOSN(190.)
      NY=NYPOSN(0.75)
      CALL LEGPOS(NX,NY)
      CALL LEGLIN(CBUF,'sin (x)',1)
      CALL LEGLIN(CBUF,'cos (x)',2)
      CALL LEGTIT('Legend')
      CALL LEGEND(CBUF,3)

      CALL DISFIN
      END
```

Demonstration of CURVE

Legend
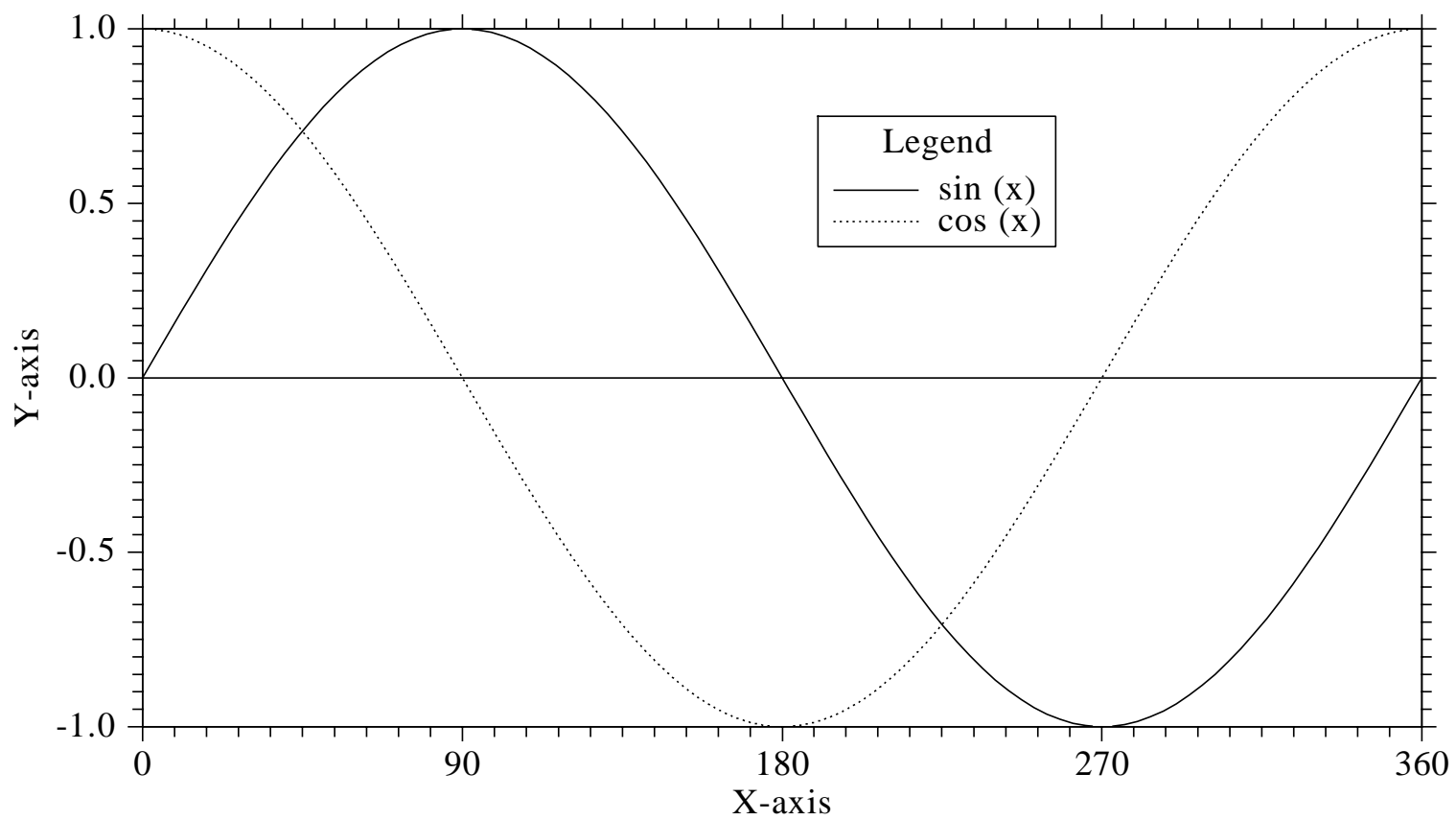
B.7   Shading Patterns (AREAF)

```fortran
      PROGRAM EXA_7
C     USE DISLIN          for Fortran 90!
      DIMENSION IXP(4),IYP(4),IX(4),IY(4)
      CHARACTER*60 CTIT,CSTR*2
      DATA IX/0,300,300,0/IY/0,0,400,400/

      CTIT='Shading Patterns (AREAF)'

      CALL DISINI
      CALL PAGERA
      CALL COMPLX

      CALL HEIGHT(50)
      NL=NLMESS(CTIT)
      NX=(2970-NL)/2
      CALL MESSAG(CTIT,NX,200)

      NX0=335
      NY0=350

      DO I=1,3
        NY=NY0+(I-1)*600
        DO J=1,6
          NX=NX0+(J-1)*400
          II=(I-1)*6+J-1
          CALL SHDPAT(II)
          WRITE(CSTR,'(I2)') II

          DO K=1,4
            IXP(K)=IX(K)+NX
            IYP(K)=IY(K)+NY
          END DO
          CALL AREAF(IXP,IYP,4)

          NL=NLMESS(CSTR)
          NX=NX+(300-NL)/2
          CALL MESSAG(CSTR,NX,NY+460)
        END DO
      END DO

      CALL DISFIN
      END
```
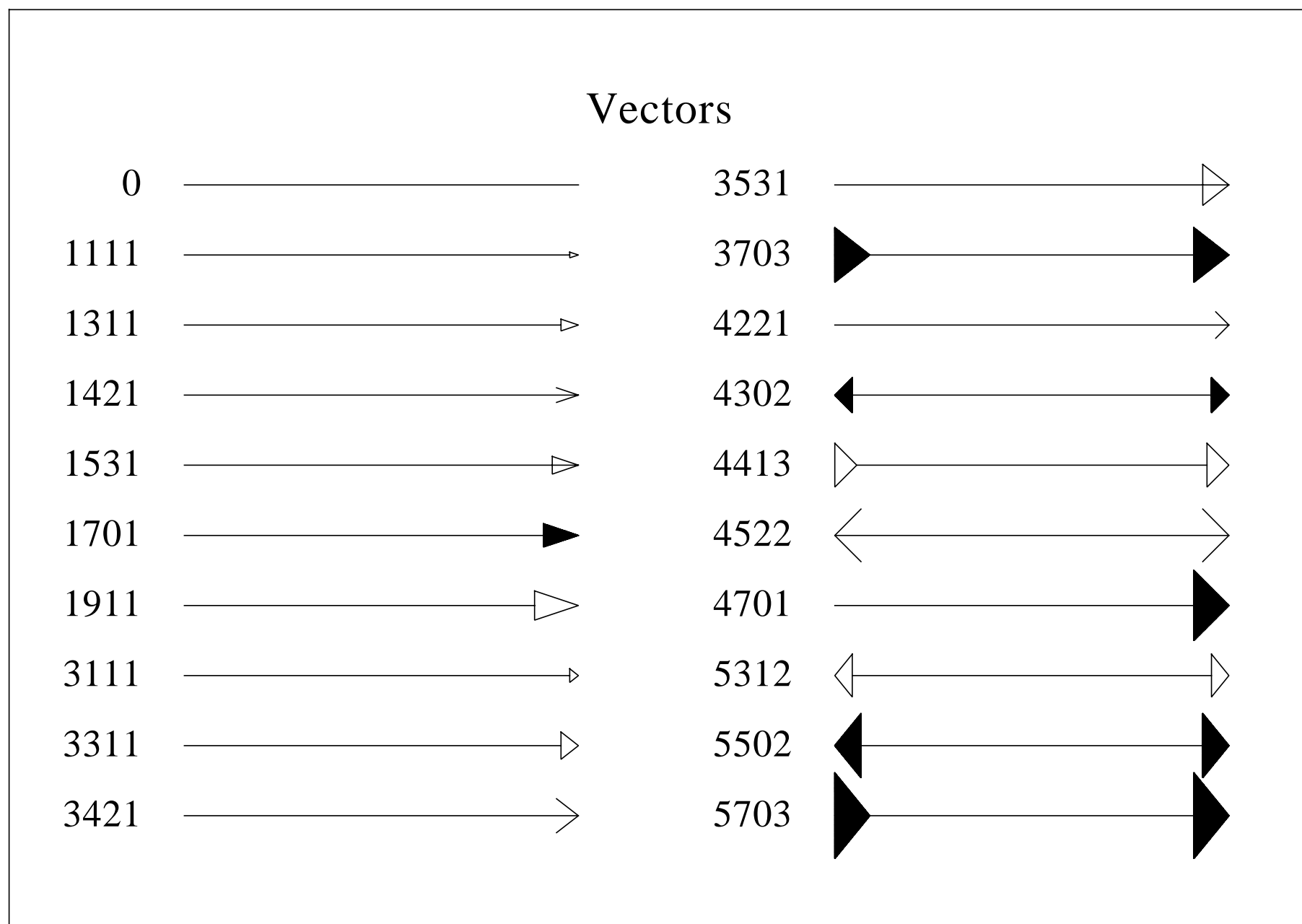
Figure B.7: Shading Patterns

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B.8 Vectors

```
      PROGRAM EXA_8
C     USE DISLIN          for Fortran 90!
      DIMENSION IVEC(20)
      CHARACTER*60 CTIT,CNUM*4
      DATA IVEC/0,1111,1311,1421,1531,1701,1911,
     *         3111,3311,3421,3531,3703,4221,4302,
     *         4413,4522,4701,5312,5502,5703/

      CTIT='Vectors'

      CALL DISINI
      CALL PAGERA
      CALL COMPLX

      CALL HEIGHT(60)
      NL=NLMESS(CTIT)
      NX=(2970-NL)/2
      CALL MESSAG(CTIT,NX,200)

      CALL HEIGHT(50)
      NX=300
      NY=400

      DO I=1,20
        IF(I.EQ.11) THEN
          NX=NX+2970/2
          NY=400
        END IF

        WRITE(CNUM,'(I4)') IVEC(I)
        NL=NLMESS(CNUM)
        CALL MESSAG(CNUM,NX-NL,NY-25 )

        CALL VECTOR(NX+100,NY,NX+1000,NY,IVEC(I))
        NY=NY+160
      END DO

      CALL DISFIN
      END
```

Vectors

B.9 Shading Patterns (PIEGRF)

```
      PROGRAM EXA_9
C     USE DISLIN          for Fortran 90!
      DIMENSION XRAY(18)
      CHARACTER*60 CTIT,CBUF*36,CSTR*2
      DATA XRAY/18*1./

      CTIT='Shading Patterns (PIEGRF)'

      CALL SETPAG('DA4P')
      CALL DISINI
      CALL PAGERA
      CALL COMPLX

      CALL AXSPOS(250,2700)
      CALL AXSLEN(1600,2200)
      CALL TITLIN(CTIT,3)
      CALL HEIGHT(50)

      CALL LEGINI(CBUF,18,2)

      DO I=1,18
        WRITE(CSTR,'(I2)') I-1
        CALL LEGLIN(CBUF,CSTR,I)
      END DO

      CALL LABELS('NONE','PIE')
      CALL PIEGRF(CBUF,1,XRAY,18)
      CALL TITLE

      CALL DISFIN
      END
```

Shading Patterns (PIEGRF)
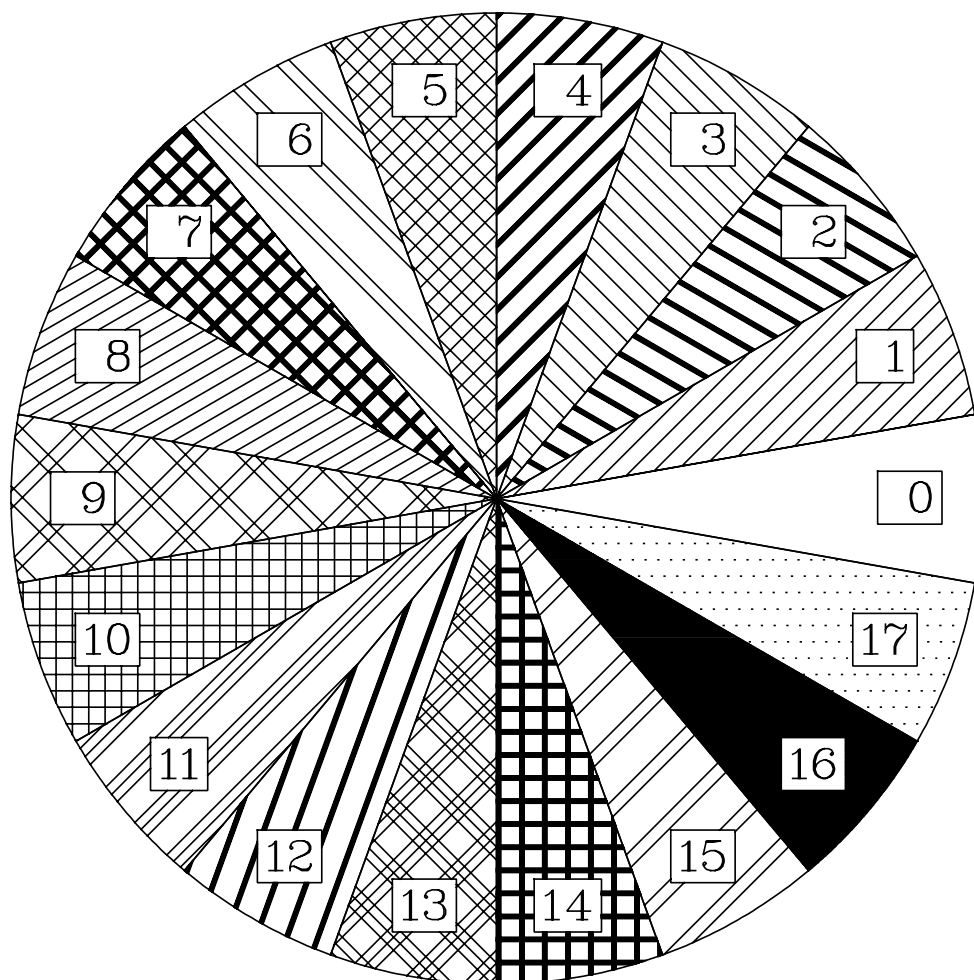
Figure B.9: Shading Patterns

B.10   3-D Bar Graph / 3-D Pie Chart

```
          PROGRAM EXA_10
C     USE DISLIN           for Fortran 90!
          CHARACTER*80 CBUF
          REAL XRAY(5),Y1RAY(5),Y2RAY(5)
          INTEGER IC1RAY(5),IC2RAY(5)
          DATA XRAY/2.,4.,6.,8.,10./,Y1RAY/0.,0.,0.,0.,0./,
     *        Y2RAY/3.2,1.5,2.0,1.0,3.0/
          DATA IC1RAY/50,150,100,200,175/,
     *        IC2RAY/50,150,100,200,175/

          CALL METAFL('POST')
          CALL SETPAG('DA4P')
          CALL DISINI
          CALL PAGERA
          CALL HWFONT

          CALL TITLIN('3-D Bar Graph / 3-D Pie Chart', 2)
          CALL HTITLE(40)

          CALL SHDPAT(16)
          CALL AXSLEN(1500,1000)
          CALL AXSPOS(300,1400)

          CALL BARWTH(0.5)
          CALL BARTYP('3DVERT')
          CALL LABELS('SECOND','BARS')
          CALL LABPOS('OUTSIDE','BARS')
          CALL LABCLR(255,'BARS')
          CALL GRAF(0.,12.,0.,2.,0.,5.,0.,1.)
          CALL TITLE
          CALL COLOR('RED')
          CALL BARS(XRAY,Y1RAY,Y2RAY,5)
          CALL ENDGRF

          CALL SHDPAT(16)
          CALL LABELS('DATA','PIE')
          CALL LABCLR(255,'PIE')
          CALL CHNPIE('NONE')
          CALL PIECLR(IC1RAY,IC2RAY,5)
          CALL PIETYP('3D')
          CALL AXSPOS(300,2700)
          CALL PIEGRF(CBUF,0,Y2RAY,5)
          CALL DISFIN
          END
```
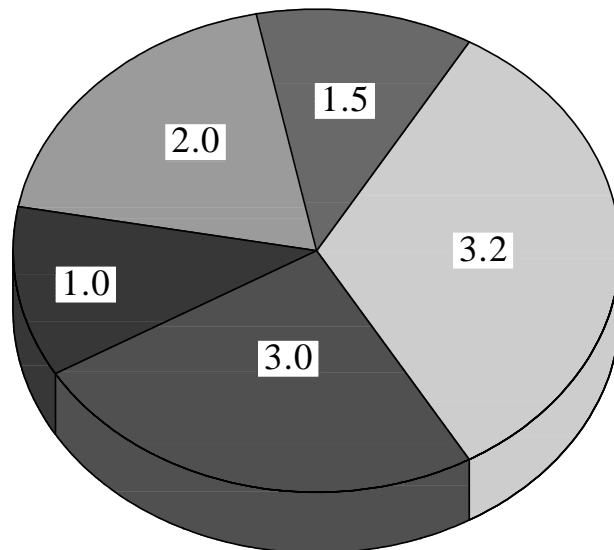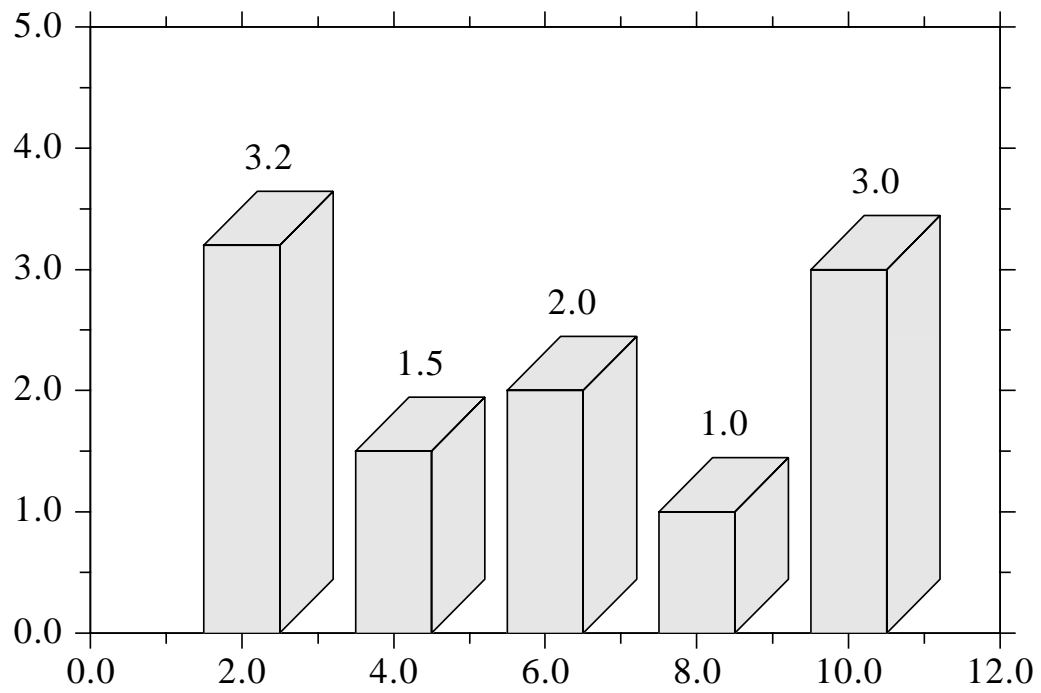
3-D Bar Graph / 3-D Pie Chart

Figure B.10: 3-D Bar Graph / 3-D Pie Chart

B.11 Surface Plot (SURFUN)

```fortran
      PROGRAM EXA_11
C     USE DISLIN          for Fortran 90!
      CHARACTER*60 CTIT1,CTIT2
      EXTERNAL ZFUN

      CTIT1='Surface Plot (SURFUN)'
      CTIT2='F(X,Y) = 2*SIN(X)*SIN(Y)'

      CALL SETPAG('DA4P')
      CALL DISINI
      CALL PAGERA
      CALL COMPLX

      CALL AXSPOS(200,2600)
      CALL AXSLEN(1800,1800)

      CALL NAME('X-axis','X')
      CALL NAME('Y-axis','Y')
      CALL NAME('Z-axis','Z')

      CALL TITLIN(CTIT1,2)
      CALL TITLIN(CTIT2,4)

      CALL VIEW3D(-5.,-5.,4.,'ABS')
      CALL GRAF3D(0.,360.,0.,90.,0.,360.,0.,90.,
     *            -3.,3.,-3.,1.)
      CALL HEIGHT(50)
      CALL TITLE

      CALL SURFUN(ZFUN,1,10.,1,10.)

      CALL DISFIN
      END

      FUNCTION ZFUN(X,Y)
      FPI=3.14159/180.
      ZFUN=2*SIN(X*FPI)*SIN(Y*FPI)
      END
```

Surface Plot (SURFUN)

F(X,Y) = 2*SIN(X)*SIN(Y)
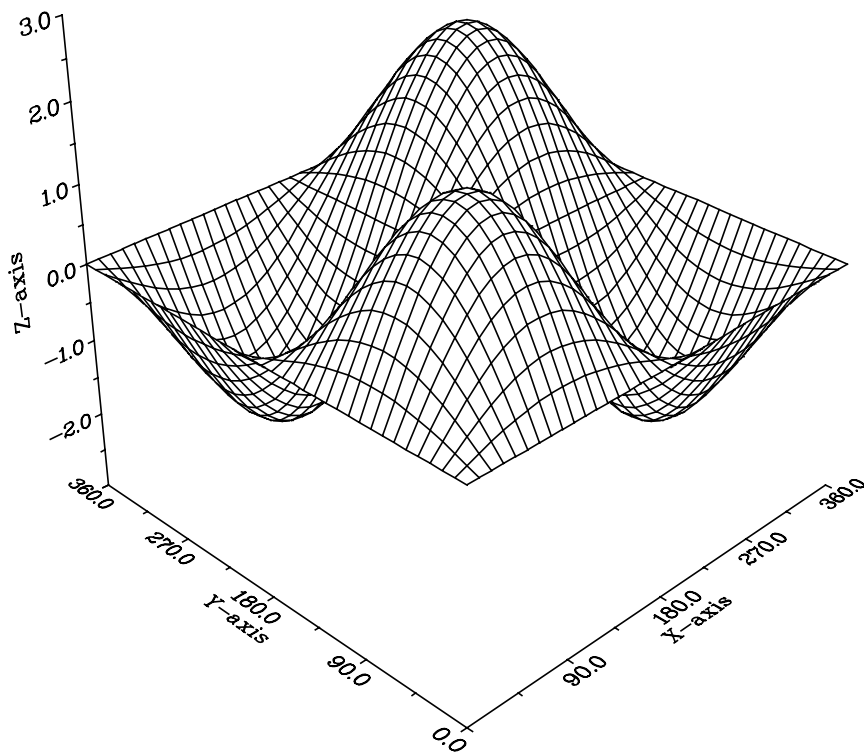
Figure B.10: Surface Plot

B.12   Map Plot

```
      PROGRAM EXA_12
C     USE DISLIN          for Fortran 90!
      DIMENSION XC(9),YC(9)
      CHARACTER*12 CSTR(9)

      DATA XC/-22.,18.,37.5,0.,2.5,12.5,23.5,-3.75,14.25/
     *     YC/64.,59.6,56.,51.5,48.5,42.,38.,40.3,50.1/
     *   CSTR/'Reykjavik','Stockholm','Moskau','London',
     *        'Paris','Rom','Athen','Madrid','Prag'/

      CALL METAFL('POST')
      CALL DISINI
      CALL PAGERA
      CALL HWFONT

      CALL AXSPOS(500,1850)
      CALL AXSLEN(2200,1400)

      CALL LABDIG(-1,'xy')
      CALL TICKS(1,'xy')
      CALL NAME('Longitude','x')
      CALL NAME('Latitude','y')

      CALL TITLIN('Map Plot',3)
      CALL INCMRK(-1)

      CALL LABELS('MAP','xy')
      CALL PROJCT('LAMBERT')
      CALL FRAME(3)
      CALL GRAFMP(-40.,60.,-40.,20.,35.,70.,40.,10.)

      CALL WORLD
      CALL CURVMP(XC,YC,9)

      DO I=1,9
        CALL POS2PT(XC(I),YC(I),XP,YP)
        NXP=XP+30
        NYP=YP
        CALL MESSAG(CSTR(I),NXP,NYP)
      END DO

      CALL GRIDMP(1,1)

      CALL HEIGHT(50)
      CALL TITLE
      CALL DISFIN
      END
```
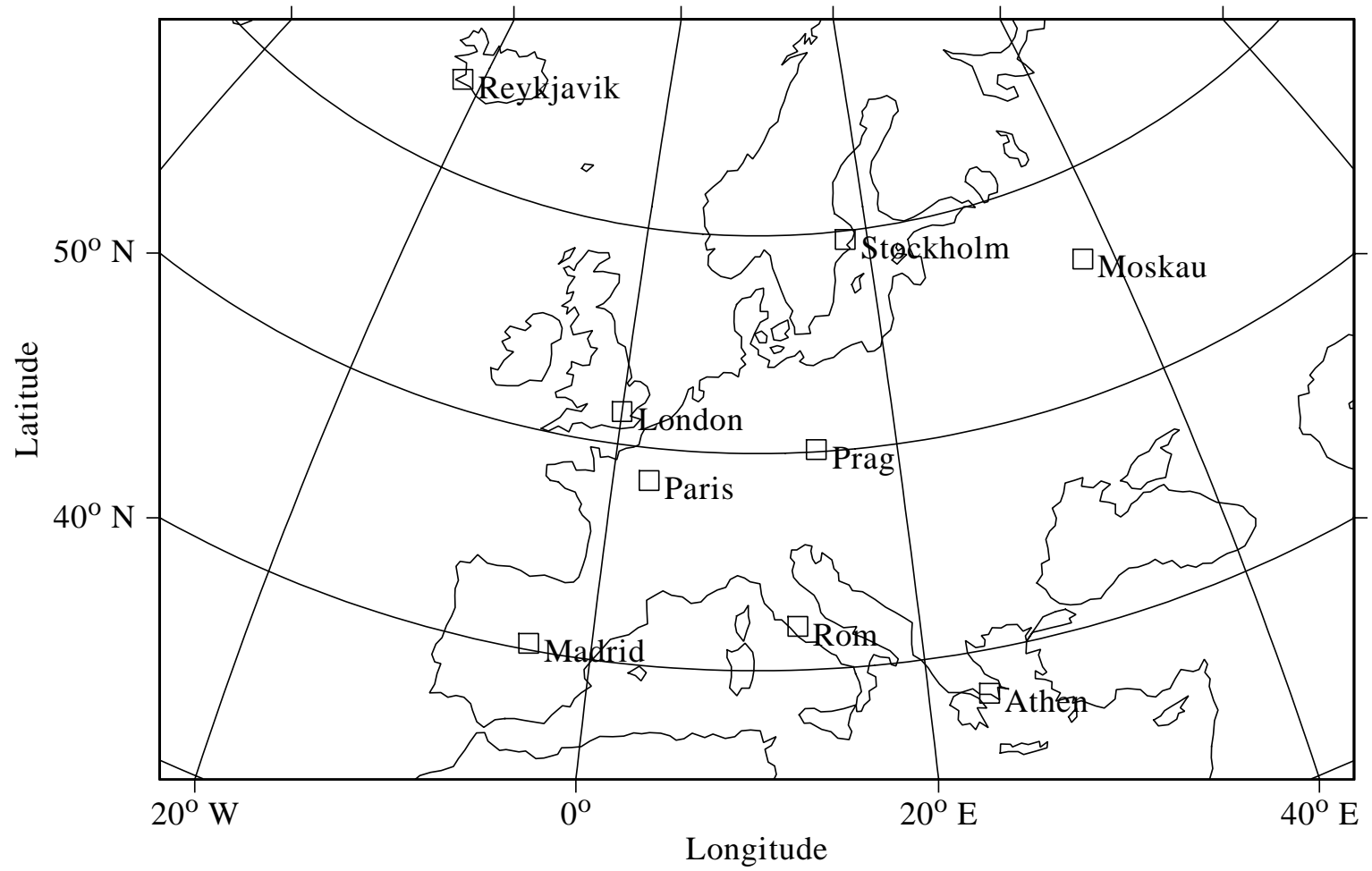
Map Plot

Latitude

Longitude

50° N — Stockholm, Moskau

40° N — Paris

20° W   0°   20° E   40° E

Reykjavik, London, Prag, Madrid, Rom, Athen

Appendix C

Index

This appendix presents all routines in the graphics library in alphabetical order. For parameters, the following conventions are used:

- INTEGER variables begin with the character N or I
- CHARACTER variables begin with the character C
- other variables are REAL
- arrays end with the keyword 'RAY'.

The abbreviations have the meaning:

    ps   denotes a parameter setting routine

    rq   denotes a parameter requesting routine

    p   denotes a plot routine.

    w   denotes a widget routine.

Routine	Parameter	Level		Page
ABS3PT	(X, Y, Z, XP, YP)	3		154
ANGLE	(NGRAD)	1,2,3	ps	48
ARCELL	(NX, NY, NA, NB, A, B, T)	1,2,3	p	92
AREAF	(NXRAY, NYRAY, N)	1,2,3	p	92
AUTRES	(IXDIM, IYDIM)	1	ps	124
AX2GRF	none	1,2,3	ps	44
AX3LEN	(NXL, NYL, NZL)	1	ps	125
AXCLRS	(NCLR, COPT, CAX)	1,2,3	ps	46
AXENDS	(CSTR, CAX)	1,2,3	ps	43
AXGIT	none	2,3	p	17
AXIS3D	(X3AXIS, Y3AXIS, Z3AXIS)	1,2,3	ps	137
AXSBGD	(NCLR)	1,2,3	ps	46
AXSLEN	(NXL, NYL)	1	ps	36
AXSORG	(NX, NY)	1	ps	36
AXSPOS	(NXA, NYA)	1	ps	35
AXSSCL	(CSCL,CAX)	1,2,3	ps	36
AXSTYP	(COPT)	1	ps	35
BARBOR	(ICLR)	1,2,3	ps	109

Routine	Parameter	Level		Page
BARCLR	(IC1, IC2, IC3)	1,2,3	ps	109
BARGRP	(NGRP, GAP)	1,2,3	ps	108
BARMOD	(CMOD,COPT)	1,2,3	ps	108
BAROPT	(XF, ANG)	1,2,3	ps	109
BARPOS	(COPT)	1,2,3	ps	108
BARS	(XRAY, Y1RAY, Y2RAY, N)	2,3	p	107
BARTYP	(CTYP)	1,2,3	ps	107
BARWTH	(FACTOR)	1,2,3	ps	75, 108
BASALF	(CALPH)	1,2,3	ps	52
BASDAT	(ID, IM, IY)	0,1,2,3	ps	100
BEZIER	(XRAY, YRAY, N, XPRAY, YPRAY, NP)	0,1,2,3		99
BITSI2	(NBITS, NINP2, IINP, NOUT2, IOUT, IOPT)	0,1,2,3		101
BITSI4	(NBITS, NINP, IINP, NOUT, IOUT, IOPT)	0,1,2,3		102
BOX2D	none	1,2,3	p	16
BOX3D	none	3	p	140
CENTER	none	1,2,3	ps	36
CGMBGD	(XR, XG, XB)	0,1,2,3	ps	28
CGMPIC	(CSTR)	0,1,2,3	ps	28
CHAANG	(ANGLE)	1,2,3	ps	50
CHASPC	(XSPC)	1,2,3	ps	49
CHAWTH	(XWTH)	1,2,3	ps	50
CHNATT	none	1,2,3	ps	73
CHNCRV	(CATT)	1,2,3	ps	73
CHNDOT	none	1,2,3	ps	76
CHNDSH	none	1,2,3	ps	76
CHNPIE	(CATT)	1,2,3	ps	111
CIRC3P	(X1, Y1, X2, Y2, X3, Y3, XM, YM, R)	0,1,2,3		100
CIRCLE	(NX, NY, NR)	1,2,3	p	91
CIRCSP	(NSPC)	1,2,3	ps	93
CLIP3D	(COPT)	1,2,3	ps	146
CLOSFL	(NLU)	0,1,2,3		104
CLPBOR	(COPT)	2,3	ps	45
CLPWIN	(NX, NY, NW, NH)	1,2,3	ps	45
CLRCYC	(INDEX, ICLR)	1,2,3	ps	79
CLRMOD	(CMOD)	0	ps	32
CLSWIN	(ID)	1,2,3	ps	132
COLOR	(CCOL)	1,2,3	ps	25
COLRAN	(NCA, NCE)	1,2,3	ps	126
COLRAY	(ZRAY, NRAY, N)	3		134
COMPLX	none	1,2,3	ps	50
CONCRV	(XRAY, YRAY, N, ZLEV)	2,3	p	177
CONGAP	(XFAC)	1,2,3	ps	181
CONLAB	(CSTR)	1,2,3	ps	181
CONMAT	(ZMAT, N, M, ZLEV)	2,3	p	178
CONMOD	(XFAC, XQUOT)	1,2,3	ps	181
CONN3D	(X, Y, Z)	3	p	153
CONNPT	(X, Y)	1,2,3	p	89
CONPTS	(XRAY, N, YRAY, M, ZMAT, ZLEV, XPTS, YPTS, MAXPTS, IRAY, MAXCRV, NCRV)	0,1,2,3		179

Routine	Parameter	Level		Page
CONSHD	(XRAY, N, YRAY, M, ZMAT, ZLVRAY, NLEV)	2,3	p	179
CONTRI	(XRAY, YRAY, ZVRAY, N, I1RAY, I2RAY, I3RAY, NTRI, ZLEV)	2,3	p	178
CONTUR	(XRAY, N, YRAY, M, ZMAT, ZLEV)	2,3	p	177
CROSS	none	2,3	p	17
CRVMAT	(ZMAT, N, M, IXPTS, IYPTS)	3	p	123
CRVTRI	(XRAY, YRAY, ZVRAY, N, I1RAY, I2RAY, I3RAY, NTRI)	2,3	p	123
CSRMOV	(NXRAY, NYRAY, NMAX, N, IRET)	1,2,3		103
CSRPT1	(NX, NY)	1,2,3		103
CSRPTS	(NXRAY, NYRAY, NMAX, N, IRET)	1,2,3		103
CSRUNI	(COPT)	1,2,3	ps	103
CURV3D	(XRAY, YRAY, ZRAY, N)	3	p	140
CURVE	(XRAY, YRAY, N)	2,3	p	19
CURVE3	(XRAY, YRAY, ZRAY, N)	3	p	123
CURVMP	(XRAY, YRAY, N)	2	p	165
CURVX3	(XRAY, Y, ZRAY, N)	3	p	123
CURVY3	(X, YRAY, ZRAY, N)	3	p	123
DASH	none	1,2,3	ps	76
DASHL	none	1,2,3	ps	76
DASHM	none	1,2,3	ps	76
DIGITS	(NDIG, CAX)	1,2,3	ps	41
DISALF	none	1,2,3	ps	50
DISFIN	none	1,2,3	ps	11
DISINI	none	0		11
DOT	none	1,2,3	ps	76
DOTL	none	1,2,3	ps	76
DUPLX	none	1,2,3	ps	50
DWGBUT	(CSTR, IVAL)	0	w	203
DWGFIL	(CLAB, CFIL, CMASK)	0	w	204
DWGLIS	(CLAB, CLIS, ISEL)	0	w	204
DWGMSG	(CSTR)	0	w	203
DWGTXT	(CLAB, CSTR)	0	w	203
ELLIPS	(NX, NY, NA, NB)	1,2,3	p	91
ENDGRF	none	2,3		16
ERASE	none	1,2,3	p	122
ERRBAR	(XRAY, YRAY, E1RAY, E2RAY, N)	2,3	p	22
ERRDEV	(CDEV)	0	p	31
ERRFIL	(CFIL)	0	p	31
EUSHFT	(CNAT, CHAR)	1,2,3	ps	53
EXPZLB	(CSTR)	1,2,3	ps	128
FCHA	(X, NDIG, NL, CSTR)	0,1,2,3		98
FIELD	(X1RAY, Y1RAY, X2RAY, Y2RAY, N, IVEC)	2, 3	p	23
FILBOX	(NX, NY, NW, NH)	1,2,3	ps	14
FILCLR	(CMOD)	1,2,3	ps	14
FILMOD	(CMOD)	0,1,2,3	ps	27
FIXSPC	(XFAC)	1,2,3	ps	50
FLAB3D	none	1,2,3	ps	140
FLEN	(X, NDIG, NL)	0,1,2,3		98

Routine	Parameter	Level		Page
FRAME	(NFRM)	1,2,3	ps	45
FRMESS	(NFRM)	1,2,3	ps	48
GAPCRV	(XGAP)	1,2,3	ps	74
GETALF	(CALPH)	1,2,3	rq	84
GETANG	(NANG)	1,2,3	rq	84
GETBPP	(NBPP)	0,1,2,3	rq	88
GETCLP	(NX, NY, NW, NH)	1,2,3	rq	88
GETCLR	(NCOL)	1,2,3	rq	86
GETDIG	(NXDIG, NYDIG, NZDIG)	1,2,3	rq	85
GETDSP	(CDSP)	0,1,2,3	rq	88
GETFIL	(CFIL)	1,2,3	rq	83
GETGRF	(XA, XE, XOR, XSTP, CAX)	2,3	rq	85
GETHGT	(NHCHAR)	1,2,3	rq	82
GETIND	(INDEX, XR, XG, XB)	1,2,3	rq	87
GETLAB	(CXLAB, CYLAB, CZLAB)	1,2,3	rq	86
GETLEN	(NXL, NYL, NZL)	1,2,3	rq	84
GETLEV	(NLEV)	1,2,3	rq	86
GETLIN	(NWIDTH)	1,2,3	rq	87
GETLIT	(XP, YP, ZP, XN, YN, ZN, ICLR)	1,2,3	rq	148
GETMAT	(XRAY, YRAY, ZRAY, N, ZMAT, NX, NY, ZVAL,	2,3		149
	IMAT, WMAT)			
GETMFL	(CFMT)	1,2,3	rq	83
GETMIX	(CHAR, CMIX)	1,2,3	rq	84
GETOR	(NX0, NY0)	1,2,3	rq	83
GETPAG	(NXPAG, NYPAG)	1,2,3	rq	83
GETPAT	(NPAT)	1,2,3	rq	87
GETPLV	(NPLV)	1,2,3	rq	86
GETPOS	(NXA, NYA)	1,2,3	rq	83
GETRAN	(NCA, NCE)	1,2,3	rq	88
GETRES	(NPB, NPH)	1,2,3	rq	87
GETRGB	(XR, XG, XB)	1,2,3	rq	87
GETSCL	(NXSCL, NYSCL, NZSCL)	1,2,3	rq	86
GETSCR	(NWPIX, NHPIX)	0,1,2,3	rq	87
GETSHF	(CNAT, CHAR)	1,2,3	rq	84
GETSP1	(NXDIS, NYDIS, NZDIS)	1,2,3	rq	85
GETSP2	(NXDIS, NYDIS, NZDIS)	1,2,3	rq	85
GETSYM	(NSYM, NHSYM)	1,2,3	rq	86
GETTCL	(NMAJ, NMIN)	1,2,3	rq	85
GETTIC	(NXTIC, NYTIC, NZTIC)	1,2,3	rq	85
GETTYP	(NTYP)	1,2,3	rq	87
GETUNI	(NU)	1,2,3	rq	86
GETVER	(XVER)	0,1,2,3	rq	86
GETVK	(NV, NVFX, NVFY)	1,2,3	rq	88
GETVLT	(CVLT)	1,2,3	rq	87
GETWID	(NZB)	1,2,3	rq	88
GETWIN	(NX, NY, NW, NH)	1,2,3	rq	88
GETXID	(IVAL, CTYPE)	1,2,3	rq	88
GMXALF	(CALPH, C1, C2, N)	1,2,3	rq	84

Routine	Parameter	Level		Page
GOTHIC	none	1,2,3	ps	50
GRACE	(NGRACE)	1,2,3	ps	45
GRAF	(XA, XE, XOR, XSTP, YA, YE, YOR, YSTP)	1	p	15
GRAF3	(XA, XE, XOR, XSTP, YA, YE, YOR, YSTP, ZA, ZE, ZOR, ZSTP)	1	p	122
GRAF3D	(XA, XE, XOR, XSTP, YA, YE, YOR, YSTP, ZA, ZE, ZOR, ZSTP)	1	p	139
GRAFMP	(XA, XE, XOR, XSTP, YA, YE, YOR, YSTP)	1	p	161
GRDPOL	(IXGRID, IYGRID)	2,3	p	16
GRFFIN	none	1,2,3	ps	152
GRFINI	(X1, Y1, Z1, X2, Y2, Z2, X3, Y3, Z3)	3	ps	152
GRID	(IXGRID, IYGRID)	2,3	p	16
GRID3D	(IXGRID, IYGRID, COPT)	2,3	p	140
GRIDMP	(IXGRID, IYGRID)	2	p	161
GWGATT	(ID, IATT, COPT)	0	rq	201
GWGBOX	(ID, ISEL)	0	rq	201
GWGBUT	(ID, IVAL)	0	rq	200
GWGFIL	(ID, CFIL)	0	rq	200
GWGLIS	(ID, ISEL)	0	rq	200
GWGSCL	(ID, XVAL)	0	rq	201
GWGTXT	(ID, CSTR)	0	rq	200
GWGXID	(ID, IWINID)	0	rq	201
HEIGHT	(NHCHAR)	1,2,3	ps	48
HELVE	none	1,2,3	ps	50
HELVES	none	1,2,3	ps	50
HISTOG	(XRAY, N, XHRAY, YHRAY, NH)	0,1,2,3	ps	99
HNAME	(NHNAME)	1,2,3	ps	43
HSVRGB	(XH, XS, XV, XR, XG, XB)	0,1,2,3		127
HSYMBL	(NHSYM)	1,2,3	ps	74
HTITLE	(NHTIT)	1,2,3	ps	47
HWFONT	none	1,2,3	ps	52
HWORIG	(NX, NY)	0	ps	30
HWPAGE	(NW, NH)	0	ps	30
IMGFIN	none	1,2,3	ps	128
IMGINI	none	1,2,3	ps	128
INCCRV	(NCRV)	1,2,3	ps	73
= INCDAT	(ID, IM, IY)	0,1,2,3		101
INCFIL	(CFIL)	1,2,3	p	14
INCMRK	(NMRK)	1,2,3	ps	74
INTAX	none	1,2,3	ps	41
INTCHA	(NX, NL, CSTR)	0,1,2,3		98
INTLEN	(NX, NL)	0,1,2,3		97
ITMCAT	(CLIS, CITEM)	0,1,2,3		202
= ITMCNT	(CLIS)	0,1,2,3		202
ITMSTR	(CLIS, IDX, CITEM)	0,1,2,3		202
LABCLR	(ICLR, COPT)	1,2,3	ps	181
LABDIG	(NDIG, CAX)	1,2,3	ps	41
LABDIS	(NDIS, CAX)	1,2,3	ps	40,180
LABELS	(CLAB, CAX)	1,2,3	ps	41,180

Routine	Parameter	Level		Page
LABJUS	(CJUS, CAX)	1,2,3	ps	39
LABMOD	(CKEY, CVAL, CAX)	1,2,3	ps	40
LABPOS	(CPOS, CAX)	1,2,3	ps	41
LABTYP	(CTYP, CAX)	1,2,3	ps	40
LEGCLR	none	1,2,3	ps	21
LEGEND	(CBUF, NCOR)	2,3	p	20
LEGINI	(CBUF, NLIN, NMAXLN)	1,2,3	ps	20
LEGLIN	(CBUF, CSTR, ILIN)	1,2,3	ps	20
LEGOPT	(XF1, XF2, XF3)	1,2,3	ps	21
LEGPAT	(ITYP, ITHK, ISYM, ICLR, IPAT, ILIN)	1,2,3	ps	21
LEGPOS	(NX, NY)	1,2,3	ps	21
LEGTIT	(CSTR)	1,2,3	ps	21
LFTTIT	none	1,2,3	ps	46
LIGHT	(CMODE)	1,2,3	ps	147
LINCYC	(INDEX, ITYP)	1,2,3	ps	79
LINE	(NX, NY, NU, NV)	1,2,3	p	90
LINESP	(XFAC)	1,2,3	ps	47
LINTYP	(NTYP)	1,2,3	ps	76
LINWID	(NWIDTH)	1,2,3	ps	76
LITMOD	(ID,CMODE)	1,2,3	ps	147
LITOPT	(ID,XVAL,CTYPE)	1,2,3	ps	147
LITPOS	(ID,XP,YP,ZP,COPT)	1,2,3	ps	147
LNCAP	(CAP)	1,2,3	ps	77
LNJOIN	(CJOIN)	1,2,3	ps	77
LNMLT	(XFC)	1,2,3	ps	77
LOGTIC	(CMOD)	1,2,3	ps	38
MAPBAS	(COPT)	1,2,3	ps	166
MAPLEV	(COPT)	1,2,3	ps	166
MAPMOD	(CMODE)	1,2,3	ps	167
MAPPOL	(XPOL, YPOL)	1	ps	166
MAPREF	(YLOWER, YUPPER)	1	ps	167
MAPSPH	(XRAD)	1	ps	166
MARKER	(NSYM)	1,2,3	ps	74
MATOPT	(XVAL, CTYPE)	1,2,3	ps	148
MDFMAT	(IX, IY, WEIGHT)	1,2,3	ps	150
MESSAG	(CSTR, NX, NY)	1,2,3	p	11
METAFL	(CFMT)	0	ps	26
MIXALF	none	1,2,3	ps	62
MIXLEG	none	1,2,3	ps	21
MPAEPL	(IOPT)	1,2,3	p	215
MPLANG	(XANG)	1,2,3	ps	216
MPLCLR	(NBG, NFG)	1,2,3	ps	215
MPLPOS	(NX, NX)	1,2,3	ps	215
MPLSIZ	(NSIZE)	1,2,3	ps	215
MSGBOX	(CSTR)	0	w	202
MSHCLR	(ICLR)	1,2,3	ps	145
MYLAB	(CSTR, ITICK, CAX)	1,2,3	ps	39
MYLINE	(NRAY, N)	1,2,3	ps	76
MYPAT	(IANG, ITYPE, IDENS, ICROSS)	1,2,3	ps	78

Routine	Parameter	Level		Page
MYVLT	(XRRAY, XGRAY, XBRAY, N)	0,1,2,3	ps	127
NAMDIS	(NDIS, CAX)	1,2,3	ps	43
NAME	(CSTR, CAX)	1,2,3	ps	43
NAMJUS	(CJUS, CAX)	1,2,3	ps	43
NEGLOG	(EPS)	1,2,3	ps	19
NEWMIX	none	1,2,3	ps	62
NEWPAG	none	1	ps	30
= NLMESS	(CSTR)	1,2,3		97
= NLNUMB	(X, NDIG)	1,2,3		97
NOARLN	none	1,2,3	ps	78
NOBAR	none	1,2,3	ps	126
NOBGD	none	1,2,3	ps	126
NOCHEK	none	1,2,3	ps	75
NOCLIP	none	1,2,3	ps	45
NOFILL	none	1,2,3	ps	216
NOGRAF	none	1	ps	44
NOHIDE	none	1,2,3	ps	144
NOLINE	(CAX)	1,2,3	ps	43
NUMBER	(X, NDIG, NX, NY)	1,2,3	p	11
NUMFMT	(COPT)	1,2,3	ps	48
NUMODE	(CDEC, CGRP, CPOS, CFIX)	1,2,3	ps	49
=NWKDAY	(ID, IM, IY)	0,1,2,3		101
=NXLEGN	(CBUF)	2,3		21
=NXPOSN	(X)	2,3		95
=NYLEGN	(CBUF)	2,3		21
=NYPOSN	(Y)	2,3		95
=NZPOSN	(Z)	3		134
OPENFL	(CFIL, NLU, IRW, ISTAT)	0,1,2,3		104
OPNWIN	(ID)	1,2,3		132
ORIGIN	(NX0, NY0)	1	ps	25
PAGE	(NWPAGE, NHPAGE)	0	ps	28
PAGERA	none	1,2,3	p	13
PAGFLL	(NCLR)	1,2,3	p	13
PAGHDR	(CSTR1, CSTR2, IOPT, IDIR)	1,2,3	p	13
PAGMOD	(CMOD)	0	ps	29
PATCYC	(INDEX, IPAT)	1,2,3	ps	79
PDFMOD	(CMOD, CKEY)	0	ps	28
PENWID	(XWIDTH)	1,2,3	ps	76
PIE	(NXM, NYM, NR, ALPHA, BETA)	1,2,3	p	92
PIEBOR	(ICLR)	1,2,3	ps	113
PIECLR	(IC1RAY, IC2RAY, N)	1,2,3	ps	113
PIEEXP	none	1,2,3	ps	114
PIEGRF	(CBUF, NLIN, XRAY, NSEG)	1	p	111
PIELAB	(CLAB, CPOS)	1,2,3	ps	114
PIEOPT	(XF, ANG)	1,2,3	ps	114
PIETYP	(CTYP)	1,2,3	ps	111
PIEVEC	(IVEC, COPT)	1,2,3	ps	114
POINT	(NX, NY, NB, NH, NCOL)	1,2,3	p	133
POLCRV	(CPOL)	1,2,3	ps	75

Routine	Parameter	Level		Page
POS2PT	(X, Y, XP, YP)	2		167
POS3PT	(X, Y, Z, XABS, YABS, ZABS)	3		154
POSIFL	(NLU, NBYTE, ISTAT)	0,1,2,3		105
PROJCT	(CPROJ)	1	ps	163
PSFONT	(CFONT)	1,2,3	ps	51
QPLBAR	(XRAY, N)	0,1	p	211
QPLCLR	(ZMAT, IXDIM, IYDIM)	0,1	p	212
QPLCON	(ZMAT, IXDIM, IYDIM, NLEV)	0,1	p	212
QPLOT	(XRAY, YRAY, N)	0,1	p	211
QPLPIE	(XRAY, N)	0,1	p	212
QPLSCA	(XRAY, YRAY, N)	0,1	p	211
QPLSUR	(ZMAT, IXDIM, IYDIM)	0,1	p	212
RBFPNG	(CBUF, NMAX, N)	0,1,2,3		131
READFL	(NLU, IRAY, NBYTE, ISTAT)	0,1,2,3		104
REAWGT	none	0	w	202
RECFLL	(NX, NY, NW, NH, NCOL)	1,2,3	p	133
RECTAN	(NX, NY, NW, NH)	1,2,3	p	91
REL3PT	(X, Y, Z, XP, YP)	3		154
RESATT	none	1,2,3	ps	73
RESET	(CNAME)	1,2,3	ps	25
RGBHSV	(XR, XG, XB, XH, XS, XV)	0,1,2,3		127
RGTLAB	none	1,2,3	ps	42
RIMAGE	(CFIL)	1,2,3		130
RLARC	(XM, YM, XA, XB, A, B, T)	2,3	p	93
RLAREA	(XRAY, YRAY, N)	2,3	p	93
RLCIRC	(XM, YM, R)	2,3	p	93
RLCONN	(X, Y)	2,3	p	89
RLELL	(XM, YM, A, B)	2,3	p	93
RLINE	(X, Y, U, V)	2,3	p	90
RLMESS	(CSTR, X, Y)	2,3	p	12
RLNUMB	(X, NDIG, XP, YP)	2,3	p	12
RLPIE	(XM, YM, R, ALPHA, BETA)	2,3	p	93
RLPOIN	(X, Y, NB, NH, NCOL)	2,3	p	133
RLREC	(X, Y, WIDTH, HEIGHT)	2,3	p	93
RLRND	(X, Y, WIDTH, HEIGHT, IOPT)	2,3	p	93
RLSEC	(XM, YM, R1, R2, ALPHA, BETA, NCOL)	2,3	p	134
RLSTRT	(X, Y)	2,3	p	89
RLSYMB	(NSYM,X,Y)	2,3	p	12
RLVEC	(X1, Y1, X2, Y2, IVEC)	2,3	p	91
RNDREC	(NX, NY, NW, NH, IOPT)	1,2,3	p	91
RPIXEL	(IX, IY, NCLR)	1,2,3		128
RPIXLS	(IRAY, IX, IY, NW, NH)	1,2,3		129
RPNG	(CFIL)	1,2,3		131
RPPM	(CFIL)	1,2,3		131
RPXROW	(IRAY, IX, IY, N)	1,2,3		129
RTIFF	(CFIL)	1,2,3		130
RVYNAM	none	1,2,3	ps	43
SCALE	(CSCL,CAX)	1,2,3	ps	37
SCLFAC	(XFAC)	0	ps	29

Routine	Parameter	Level		Page
SCLMOD	(CMODE)	0	ps	29
SCRMOD	(CMODE)	0	ps	27
SECTOR	(NX, NY, NR1, NR2, ALPHA, BETA, NCOL)	1,2,3	p	133
SELWIN	(ID)	1,2,3	ps	132
SENDBF	none	1,2,3		121
SENDMB	none	1,2,3		203
SENDOK	none	0		203
SERIF	none	1,2,3	ps	50
SETBAS	(XFAC)	1,2,3	ps	62
SETCLR	(NCOL)	1,2,3	ps	125
SETEXP	(FEXP)	1,2,3	ps	62
SETFIL	(CFIL)	0		27
SETGRF	(C1, C2, C3, C4)	1	ps	44
SETIND	(INDEX, XR, XG, XB)	1,2,3	ps	127
SETMIX	(CHAR, CMIX)	1,2,3	ps	63
SETPAG	(CPAG)	0		28
SETRES	(NPB, NPH)	1,2,3	ps	124
SETRGB	(XR, XG, XB)	1,2,3	ps	125
SETSCL	(XRAY, N, CAX)	1,2,3	ps	37
SETVLT	(CVLT)	1,2,3	ps	126
SETXID	(ID,COPT)	0	ps	33
SHDCHA	none	1,2,3	ps	51
SHDCRV	(X1RAY, Y1RAY, N1, X2RAY, Y2RAY, N2)	2,3	p	22
SHDEUR	(INRAY, IPRAY, ICRAY, N)	2	p	165
SHDMAP	(CMAP)	2,3	p	164
SHDMOD	(CMOD, CTYPE)	1,2,3	ps	145, 182
SHDPAT	(IPAT)	1,2,3	ps	77
SHIELD	(CAREA, CMODE)	1,2,3	ps	80
SHLCIR	(NX, NY, NR)	1,2,3	ps	81
SHLDEL	(ID)	1,2,3	ps	81
SHLELL	(NX, NY, NA, NB, THETA)	1,2,3	ps	81
SHLIND	(ID)	1,2,3	ps	81
SHLPIE	(NX, NY, NR, A, B)	1,2,3	ps	81
SHLPOL	(NXRAY, NYRAY, N)	1,2,3	ps	81
SHLRCT	(NX, NY, NW, NH, THETA)	1,2,3	ps	81
SHLREC	(NX, NY, NW, NH)	1,2,3	ps	81
SHLRES	(N)	1,2,3	ps	82
SHLSUR	none	1,2,3	ps	144
SHLVIS	(ID, CMODE)	1,2,3	ps	82
SIMPLX	none	1,2,3	ps	50
SKIPFL	(NLU, NBYTE, ISTAT)	0,1,2,3		105
SMXALF	(CALPH, C1, C2, N)	1,2,3	ps	52
SOLID	none	1,2,3	ps	76
SORTR1	(XRAY, N, COPT)	0,1,2,3		98
SORTR2	(XRAY, YRAY, N, COPT)	0,1,2,3		98
SPHE3D	(XM, YM, ZM, R, N, M)	3	p	155
SPLINE	(XRAY, YRAY, N, XSRAY, YSRAY, NSPL)	1,2,3		99
SPLMOD	(NGRAD, NPTS)	1,2,3	p	75
STRT3D	(X, Y, Z)	3	p	153

Routine	Parameter	Level		Page
=YPOSN	(Y)	2,3		95
= Z3DPOS	(X, Y, Z)	3		154
ZAXIS	(A, B, OR, STEP, NL, CZ, IT, ID, NX, NY)	1,2,3	p	123
ZAXLG	(A, B, OR, STEP, NL, CZ, IT, ID, NX, NY)	1,2,3	p	123
ZBFFIN	none	1,2,3		152
ZBFINI	(IRET)	1,2,3		152
ZBFLIN	(X1, Y1, Z1, X2, Y2, Z2)	3	p	153
ZBFTRI	(XRAY, YRAY, ZRAY, IRAY)	3	p	153
ZSCALE	(ZMIN, ZMAX)	1,2,3	ps	144