



C. Function Reference

This appendix defines the predefined FEMAP functions which can be used to create equations for any numeric input. The functions are listed in alphabetical order. All function arguments are always required. Multiple arguments must be separated by a semi-colon (;), not a comma (,).

ABS(x)

returns the absolute value of the argument x. If x was positive, $ABS(x) = x$.

ACOS(x)

returns the inverse cosine (arc cosine) of x. The inverse cosine is the angle, between 0 and 180 degrees, which has a cosine equal to x.

ACTID(type)

returns the active set or ID for the selected entity type. The argument, "type", must be one of the predefined entity types (any other value of "type" returns an undefined result):

Type	Entity
1	Coordinate System
2	Point
3	Curve
4	Surface
5	Volume
6	Text
7	Boundary
8	Node
9	Element

Type	Entity
10	Material
11	Property
12	Load Set
13	Constraint Set
14	View
15	Output Set
16	Report Format
17	Connection
18	Connection Property

ASIN(x)

returns the inverse sine (arc sine) of x. The inverse sine is the angle, between -90 and 90 degrees, which has a sine equal to x.

ATAN(x)

returns the inverse tangent (arc tangent) of x. The inverse tangent is the angle, between 0 and 180 degrees, which has a tangent equal to x.

CELL(row; column)

returns the value of the selected cell in the current table control when used in a table control. When used in any other dialog box, returns value of the selected cell in the Data Surface Editor.

CNPR(cnpropID; index)

returns a property value from connection property "cnpropID". The value of "index" determines the property value that will be returned. Refer to the table of Connection Property Values in Data Block 918 of the FEMAP neutral file documentation for proper values of "index".

CNPRID(cnID)

returns the ID of the connection property that is referenced by connection “cnID”. The return will always be 0, if the connection does not reference a property.

COS(theta)

returns the cosine of the angle theta. Theta must be specified in degrees.

COUNT(type)

returns the number of entities of the selected type in the current model. Type must be one of the predefined entity types (see ACTID() function).

ELND(index;elemID)

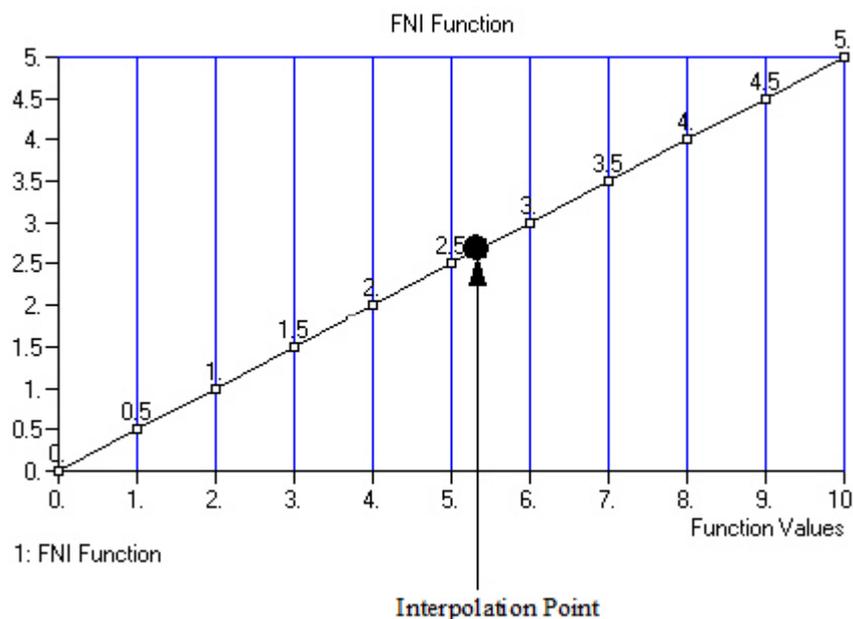
returns a nodeID which is referenced by an element. The first argument, index, selects which node on the element to report. The second argument, elemID, selects which element to report. For example ELND(3,45) returns the ID of the third node on element 45. If either the element does not exist, or the index is too large an error message will be given and the return will be undefined.

EXP(x)

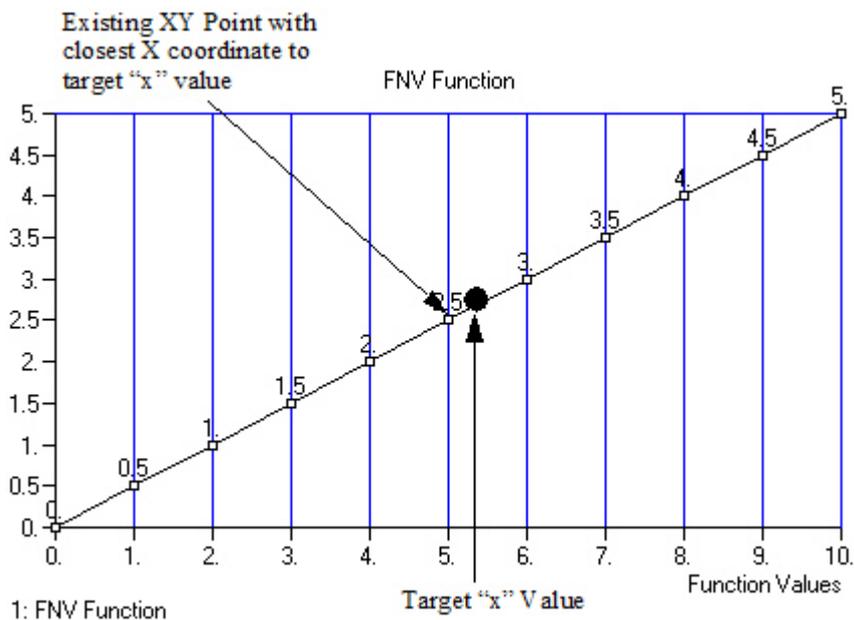
returns the value of the exponential function, e^x .

FNI(functionID;x)

returns a Y value which has been linearly interpolated from existing data points in a user-defined FEMAP XY function. The type of function defined will have no effect on the values. For example, an XY function with the ID of “1..FNI Function” is defined using the Model, Function menu. The linear curve ranges from coordinates (0,0) to (10,5) with a data point at every integer X value (i.e. delta X is equal to “1”). A Y value is needed somewhere between two existing data points, for instance, at X=5.25. The function FNI(1;5.25) would return a value of 2.625. In addition, if an interpolation point is entered outside the range of the function (for the example, X values below 0 or above 10 would be out of the range), FEMAP will use either the first two or final two data points to determine the slope of the curve outside the range, and that curve only will be used to return Y values for out of range interpolation points.

**FNV(functionID;x)**

returns a Y value of the closest defined XY data point in a user-defined FEMAP XY function based on the target value of “x” in FNV(functionID;x). The target value “x” is used to determine which existing XY point has the closest X coordinate numerical value in the function. The type of function defined will have no effect on the values. For example, an XY function with the ID of “1..FNV Function” is defined using the Model, Function menu. The linear curve ranges from coordinates (0,0) to (10,5) with a data point at every integer X value (i.e. delta X is equal to “1”). A Y value is needed somewhere between two existing data points, for instance, at X=5.25. Since 5.25 is closer to 5 than it is to 6, the data point at X value 5 will be used, therefore the function FNI(1;5.25) would return a value of 2.5. In addition, if a target “x” value is entered outside the range of the function (for the example, X values below 0 or above 10 would be out of the range), FEMAP will use the start of end data point to determine the value of Y, and that Y value will be returned for all target “x” values outside the range of the function



INT(x)

returns the closest integer value (whole number) which is lower than the real number argument, x.

LN(x)

returns the natural logarithm of x.

LOG(x)

returns the base 10 logarithm of x.

MAT(matIID; index)

returns a material value from material “matIID”. The value of “index” determines the material value that will be returned. Unlike the PROP() function, the values of “index” in this case are the same, no matter what type of material is being referenced. You should use the following values for “index”.

Index Value	Returns
0	Ex
3	Gx
6	NUxy
9	G_3D[1,1]
12	G_3D[1,4]
15	G_3D[2,2]
18	G_3D[2,5]
21	G_3D[3,4]
24	G_3D[4,4]
27	G_3D[5,5]
30	G_2D[1,1]

Index Value	Returns
1	Ey
4	Gy
7	NUyz
10	G_3D[1,2]
13	G_3D[1,5]
16	G_3D[2,3]
19	G_3D[2,6]
22	G_3D[3,5]
25	G_3D[4,5]
28	G_3D[5,6]
31	G_2D[1,2]

Index Value	Returns
2	Ez
5	Gz
8	NUzx
11	G_3D [1,3]
14	G_3D [1,6]
17	G_3D [2,4]
20	G_3D [3,3]
23	G_3D [3,6]
26	G_3D [4,6]
29	G_3D [6,6]
32	G_2D [1,3]

33	G_2D[2,2]	34	G_2D[2,3]	35	G_2D [3,3]
36	alpha[1,1]	37	alpha[1,2]	38	alpha [1,3]
39	alpha[2,2]	40	alpha[2,3]	41	alpha [3,3]
42	k[1,1]	43	k[1,2]	44	k[1,3]
45	k[2,2]	46	k[2,3]	47	k[3,3]
48	thermal cap	49	density	50	damping
51	ref Temp	52	tension limit [1]	53	tension limit[2]
54	compression limit[1]	55	compression limit[2]	56	shear limit

MAX(x;y)

returns either x or y, whichever is larger. Positive numbers are always larger than negative numbers. If you want to compare in an absolute sense use MAX(ABS(x);ABS(y)).

MAXID(type)

returns the maximum ID in the current model of the selected entity type. Type must be one of the predefined entity types (see ACTID() function).

MID(propID)

returns the ID of the material that is referenced by property “propID”. This function should not be used with laminate properties which can reference multiple materials - use MLAM() instead.

MIN(x;y)

returns either x or y, whichever is smaller. Negative numbers are always smaller than positive numbers. If you want to compare in an absolute sense use MIN(ABS(x);ABS(y)).

MINID(type)

returns the minimum ID in the current model of the selected entity type. Type must be one of the predefined entity types (see ACTID() function).

MLAM(propID; ply)

returns the ID of the material that is referenced by layer “ply” of property “propID”. This function can only be used if “propID” selects a laminate property. “ply” must be between 1 and the maximum number of allowable plies for a laminate, however the return will be 0 if you choose a ply that is not defined for the selected property.

NEXTID(type)

returns the ID of the next entity to be created of the selected type. Type must be one of the predefined entity types (see ACTID() function).

PID(elemID)

returns the ID of the property that is referenced by element “elemID”. The return will always be 0, if the element does not reference a property.

POW(x; y)

returns the value of x to the y power, x^y

PROP(propID; index)

returns a property value from property “propID”. The value of “index” determines the property value that will be returned. Refer to the table of Property Values in Data Block 402 of the FEMAP neutral file documentation for proper values of “index”. As you can see from this table, the “index” values differ depending on the type of property that you are using.

For example, if propID selects a Bar property, setting index = 0 will return Area, index = 4 will return J, the torsional constant. For a plate, index = 0 will return the thickness.

RND(x)

returns the closest integer value (whole number) which is either lower or higher than the real number argument, x.

SIN(theta)

returns the sine of the angle theta. Theta must be specified in degrees.

SQR(x)

returns the square of x. $SQR(x) = x * x$

SQRT(x)

returns the square root of x.

Note: Please be very careful when using the SQR and SQRT functions in different portions of FEMAP. When working within the FEMAP interface, such as creating an equation for loading, SQR is “square”, while SQRT returns the “square root”. When creating a “script” using the *API Programming* window (see [Section 7.2.12, "Tools, Programming, API Programming"](#)), SQR will actually return the “square root”, not “square” the value.

TAN(theta)

returns the tangent of the angle theta. Theta must be specified in degrees.

VEC(setID;vectorID;entityID)

returns an output data value. SetID defines the output set to be selected. VectorID selects an output vector in that set. EntityID is either the element ID or node ID (depending on the vector type) of the data to be selected. For example, VEC(2,1,33) returns the output value for node 33, in Output Set 2, Output Vector 1 (Total Translation).

XCUCEN(curve ID)

returns the X coordinate of the center of the selected curve, in the active coordinate system. In a cylindrical or spherical system this is the radial value.

XCUMID(curve ID)

returns the X coordinate of the midpoint of the selected curve, in the active coordinate system. In a cylindrical or spherical system this is the radial value.

XEF(elemID;faceID)

returns the X coordinate of the centroid of the selected element face. The X coordinate is always returned in the active coordinate system. In a cylindrical or spherical system, this is the radial value. The available values for faceID depend on the element type. Refer to the Element Library for more information on face numbers for each element type.

XEL(elemID)

returns the X coordinate of the centroid of the selected element, in the active coordinate system. In a cylindrical or spherical system this is the radial value.

XND(nodeID)

returns the X coordinate of the selected node, in the active coordinate system. In a cylindrical or spherical system this is the radial value. If you specify a negative nodeID, FEMAP selects the node with an ID equal to the next node to be created minus the value you specified. For example, if you specify XND(-1), and the next node to be created is 43, you will get the X coordinate of node 42, if node 42 exists.

XPT(pointID)

same as XND(), only returns the coordinates of a point.

YCUCEN(curve ID)

same as XCUCEN(), only returns the Y coordinate.

YCUMID(curve ID)

same as XCUMID(), only returns the Y coordinate.

YEF(elemID;faceID)

same as XEF(), only returns the Y coordinate.

YEL(elemID)

same as XEL(), only returns the Y coordinate.

YND(nodeID)

returns the Y coordinate of the selected node, in the active coordinate system. In a cylindrical system this is the angular value theta, in degrees. See XND() for additional information.

YPT(pointID)

same as YND(), only returns the coordinates of a point.

ZCUCEN(curve ID)

same as XCUCEN(), only returns the Z coordinate.

ZCUMID(curve ID)

same as XCUMID(), only returns the Z coordinate.

ZEF(elemID;faceID)

same as XEF(), only returns the Z coordinate.

ZEL(elemID)

same as XEL(), only returns the Z coordinate.

ZND(nodeID)

returns the Z coordinate of the selected node, in the active coordinate system. See XND() for additional information.

ZPT(pointID)

same as ZND(), only returns the coordinates of a point.

FEMAP

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