

We know that a function can be evaluated at a single point. For example, if we have an equation $f(x)$, we can evaluate the equation at any x value as shown here.

$$f(x) := \int \sin(x) dx \rightarrow -\cos(x) \quad f(\pi) = 1$$

However, a **range variable** would provide more flexibility in evaluating this equation, allowing us to:

- Iterate a function over a range of values.
- Define a vector/array's individual elements.
- Control the domain of a 2D Plot (see the 2D and 3D Plots page).

To create a range variable with a unit step:

1. Specify a variable name and a definition operator.
 2. Type a starting value.
 3. Type a comma followed by the next number in the sequence. If this number is not provided, the range variable will have a unit step.
 4. Click the range variable operator from the matrix toolbar.
- Note:** The period cannot be pressed twice.
5. Type an ending value.

$x := 1..5$

Range variable with unit step size.

1
2
3
4
5

$x := 1, 1.5..5$

Range variable with a specific step size of 0.5

1
1.5
2
2.5
3
3.5
4
4.5
5

Now that we have a range variable defined, we iterate the function $f(x)$ over this range of values.

$$f(x) := \int \sin(x) dx \rightarrow -\cos(x) \quad f(x) =$$

-0.54
0.416
0.99
0.654
-0.284

When evaluating range variables, Mathcad will only display the first 16 values in the range by default. However, if you click on the table, Mathcad will display a scroll bar to view all values, along with drag handles (small black squares along the edges of the table) to resize the table to the size you want.

$\lambda := 400, 410..700$

400
410
420
430
440
450
460
470
480
490
500
510
520
530
540
...

$\lambda =$

400
410
420
430
440
450
460
470
480
490
500
510
520
530
540
550

A vector or array can be defined element-by-element using range variables. To populate an array using range variables, select the subscript operator \times_n from the matrix toolbar.

$$C_0 := 12 \quad C_1 := 31 \quad C_2 := 19 \quad C_3 := 79$$

$$C = \begin{pmatrix} 12 \\ 31 \\ 19 \\ 79 \end{pmatrix}$$

A matrix can be defined using the same method. The subscript notation used would be row,column, as shown below.

$$D_{0,0} := 12 \quad D_{0,1} := 31 \quad D_{1,0} := 19 \quad D_{1,1} := 79$$

$$D = \begin{pmatrix} 12 & 31 \\ 19 & 79 \end{pmatrix}$$

An alternate method for defining a matrix is to automate the definition process by using an iterative variable, which is a range variable representing the index.

$$i := 1..5$$

$$\text{vector}_i := i$$

$$\text{vector} = \begin{pmatrix} 0 \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{pmatrix}$$