Instructor:

BRIJ MOHAN
Hansraj College,
University of Delhi, Delhi.

Evaluating expressions

$f := x \to x + 5$

$$f := x \mapsto x + 5 \quad \textbf{(1)}$$

$f(2)$

$$7 \quad \textbf{(2)}$$

OR use unapply to express as function

$f := y + 7:$
$f := unapply(f, y)$

$$f := y \mapsto y + 7 \quad \textbf{(3)}$$

$f(6)$

$$13 \quad \textbf{(4)}$$

OR use apply for expression only

$f := apply(f, y)$

$$f := y + 7 \quad \textbf{(5)}$$

Factorization of expressions:

$factor(x^2 - 5x + 6)$

$$(x - 2)(x - 3) \quad \textbf{(6)}$$

Factorization of Integers:

$ifactor(235)$

$$(5)(47) \quad \textbf{(7)}$$

Expansion of Expression:

$b := x^2 + 1:$
$c := x + 3:$
$expand(b \cdot c)$

$$x^3 + 3x^2 + x + 3 \quad \textbf{(8)}$$

Simplification of Expression:

$simplify(b \cdot c)$

$$(x^2 + 1)(x + 3) \quad \textbf{(9)}$$

$$simplify\left(\text{sqrt}(4) + \frac{7}{3}\right)$$

$$\frac{13}{3} \quad \textbf{(10)}$$

$$simplify\left(\frac{b}{c}\right)$$

$$\frac{x^2+1}{x+3} \quad \textbf{(11)}$$

Substitution in Expression

(11) is the equation number and can be called by pressing Ctrl+L

$$subs(x=1, \textbf{(11)})$$

$$\frac{1}{2} \quad \textbf{(12)}$$

$$subs(x=1, y=2, x+x\cdot y)$$

$$3 \quad \textbf{(13)}$$

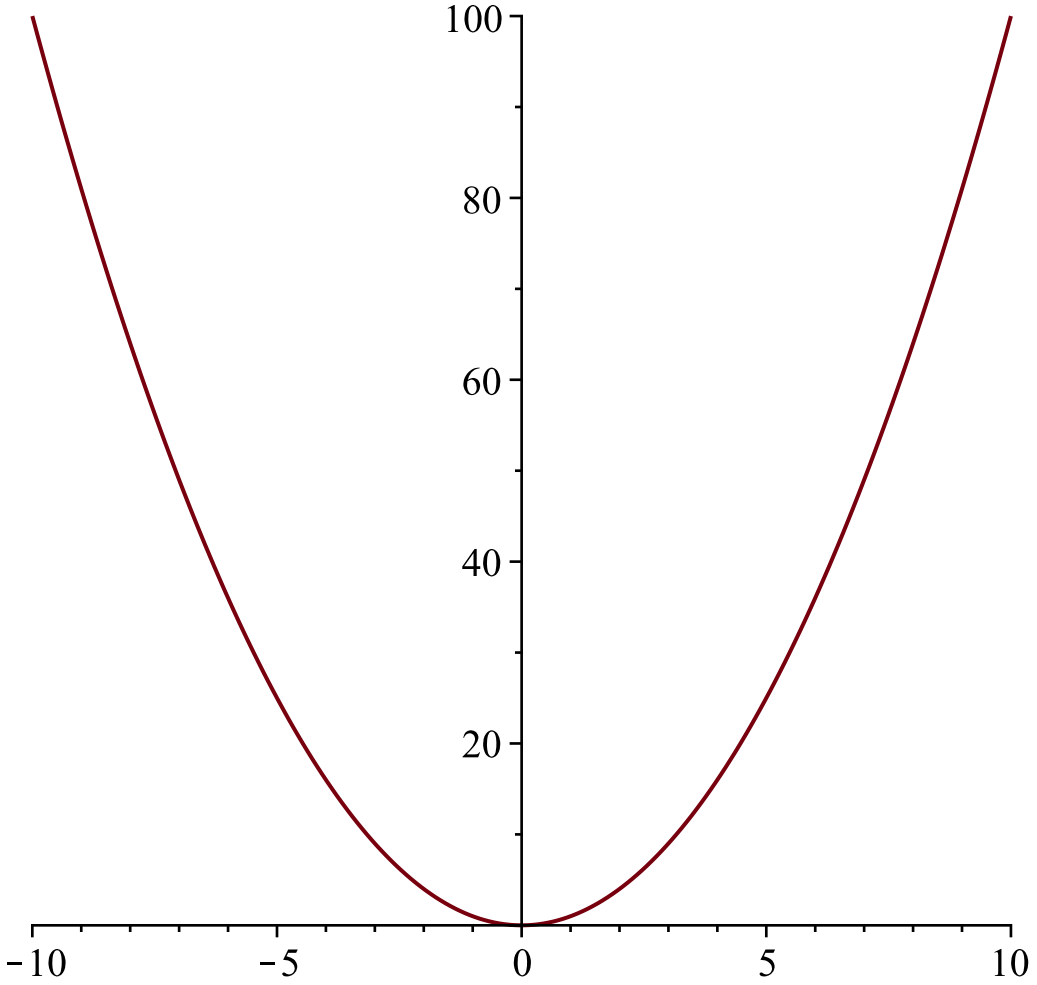
Ploting 2D functions

By default range for plotting is -10 to 10

$$f := x \to x^2$$

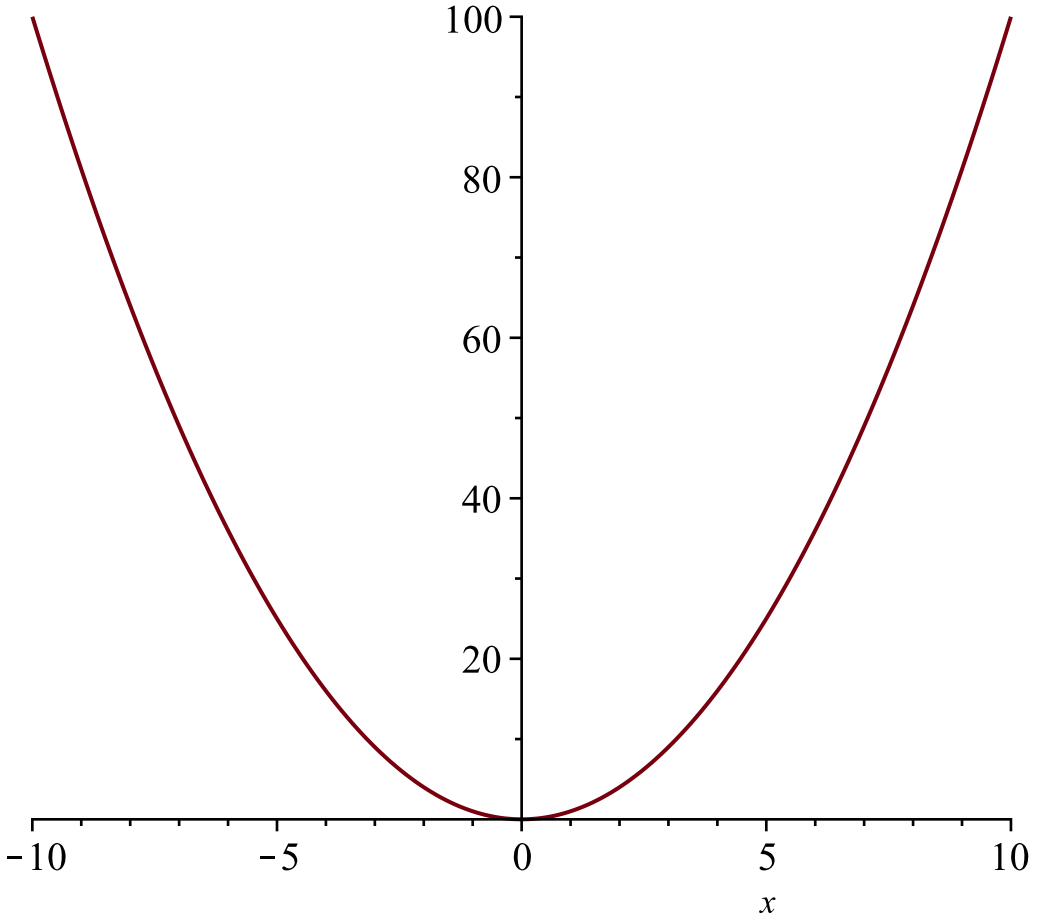
$$f := x \mapsto x^2 \quad \textbf{(14)}$$

$$plot(f)$$

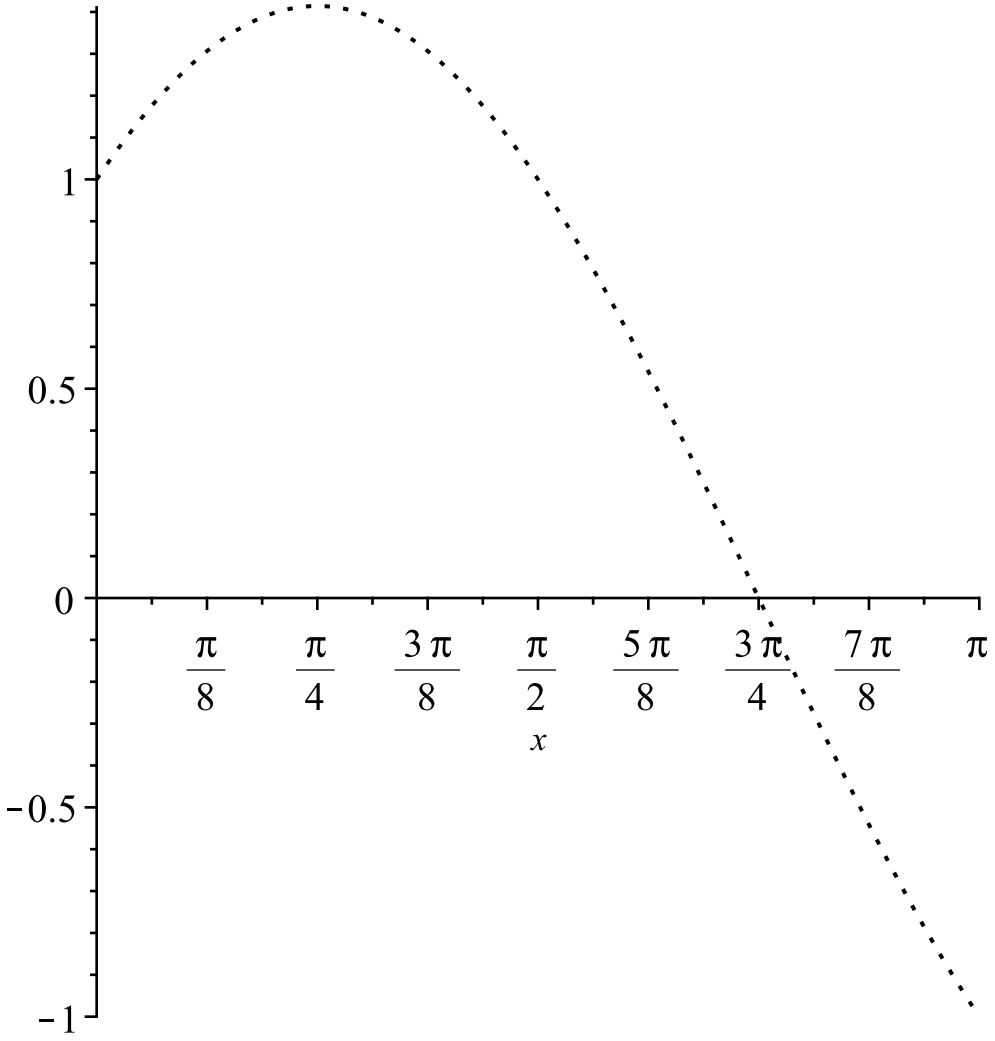


$plot(f(x), x = -10..10, title = \text{"Parabola"}, titlefont = [Calibri, 25])$

Parabola

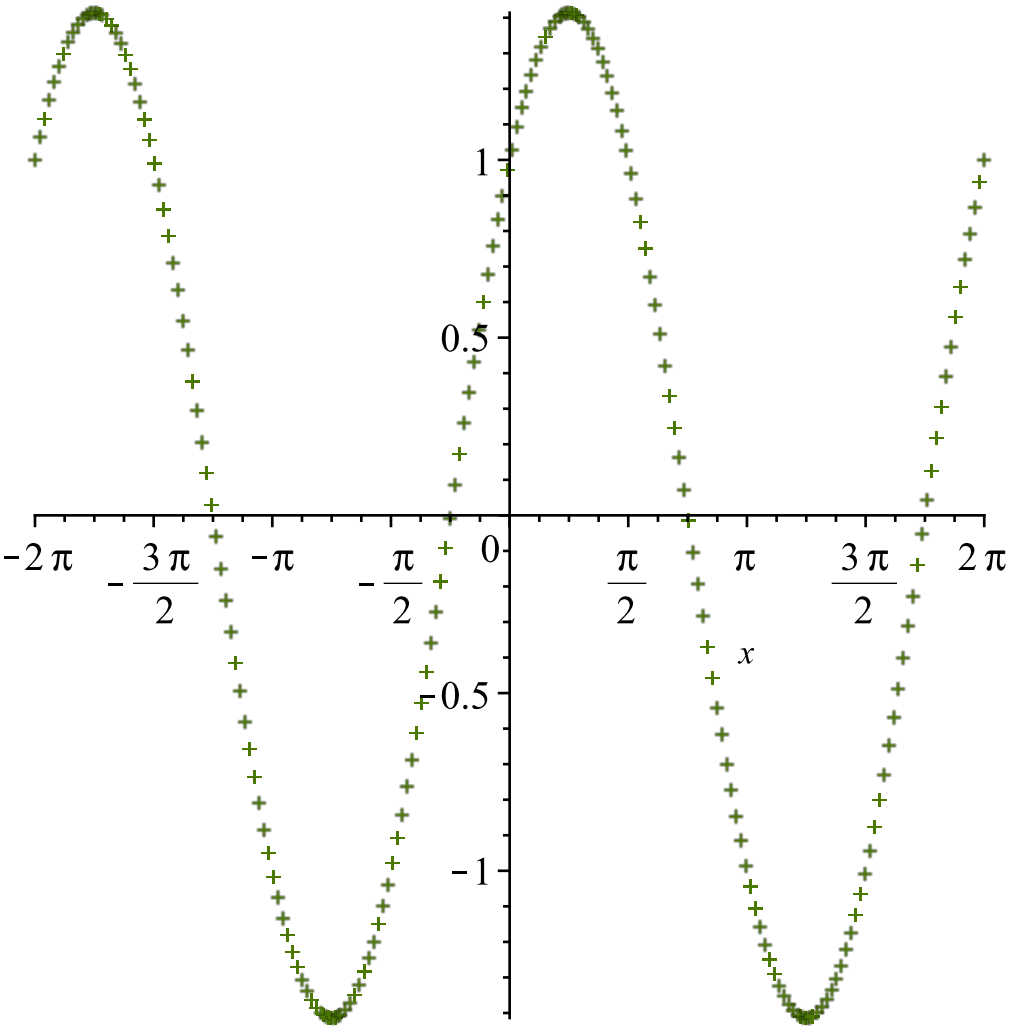


$plot(\sin(x) + \cos(x), x = 0..\pi)$



Plot Builder

$\sin(x) + \cos(x) \rightarrow$

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plot(sin(x)+cos(x), x = -2*Pi .. 2*Pi, color = "Niagara
LeafGreen",
```

Matrix Command: M (in Matrix) is capital in MTM
Two Packages
with(MTM)
with(linalg)

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with(MTM) :
A := Matrix(2, 2, [1, 2, 3, 4])
```

$$A := \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \quad \textbf{(15)}$$

```
with(linalg) :
B := matrix(2, 2, [1, 2, 3, 4])
```

$$B := \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \tag{16}$$

$C := matrix(3, 2, [1, 2, 3, 4, 5, 6])$

$$C := \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix} \tag{17}$$

$Matrix(2)$

$$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \tag{18}$$

$Matrix(2, 3, fill = 1)$

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix} \tag{19}$$

$Matrix(3, shape = identity)$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \tag{20}$$

Addition & Subtraction of Matrices

$with(MTM)$:
$A := Matrix(2, 2, [1, 2, 3, 4])$

$$A := \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \tag{21}$$

$B := Matrix(2, 2, 3)$

$$B := \begin{bmatrix} 3 & 3 \\ 3 & 3 \end{bmatrix} \tag{22}$$

$C := A + B$

$$C := \begin{bmatrix} 4 & 5 \\ 6 & 7 \end{bmatrix} \tag{23}$$

$M := A - B$

$$M := \begin{bmatrix} -2 & -1 \\ 0 & 1 \end{bmatrix} \tag{24}$$

Multiplication of Matrices: Use dot . for this directly

$N := A \cdot B$

$$N := \begin{bmatrix} 9 & 9 \\ 21 & 21 \end{bmatrix} \quad (25)$$

OR

$F := multiply(A, B)$

$$F := \begin{bmatrix} 9 & 9 \\ 21 & 21 \end{bmatrix} \quad (26)$$

Inverse of Matrix:

$IM := inverse(A)$

$$IM := \begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix} \quad (27)$$

Checking

$A \cdot IM$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad (28)$$

Determinant of Matix

$det(A)$

$$-2 \quad (29)$$

Trace of Matrix

$trace(A)$

$$5 \quad (30)$$

Transpose of Matrix

$transpose(A)$

$$\begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix} \quad (31)$$

Maple Graphics Calculator (Plot Builder, Plot, Drawing) with Context Panel in Right side:

x^2

$$x^2 \quad (32)$$

2D Plot x^2 →

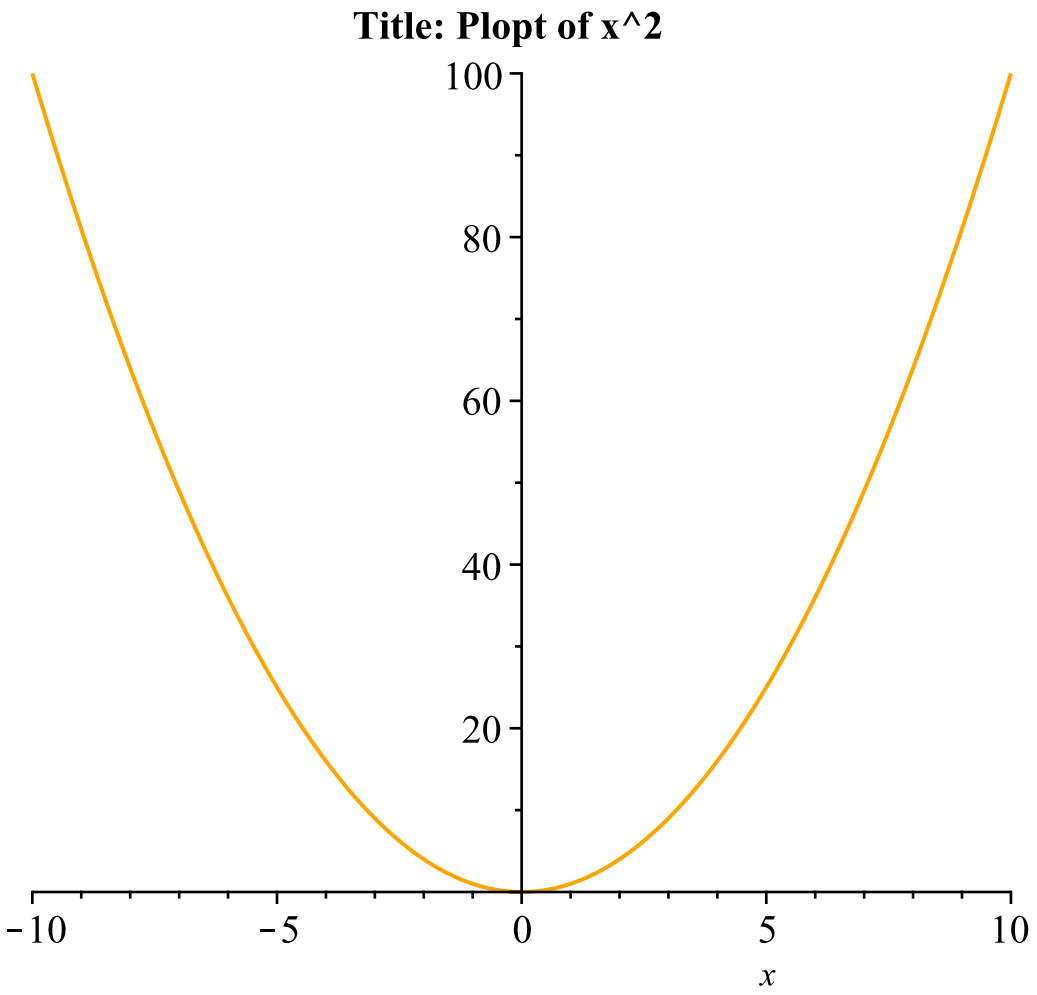

Figure 1: Parabola

$with(MTM)$:

$unwith(MTM)$
$packages(\ )$

[ ] **(33)**