Parabola. The graph of a quadratic function $f(x) = ax^2 + bx + c$ is a parabola. $f(x) = a(x-h)^2 + k$; (h,k) : vertex.

Ex 1: $f(x) = -x^2 + 6x - 12$

$= -[x^2 - 6x] - 12$

$= -[x^2 - 2\cdot 3x + 3^2 - 3^2] - 12$

$= -[(x-3)^2 - 9] - 12$

$= -(x-3)^2 + 9 - 12$

$= -(x-3)^2 - 3$.

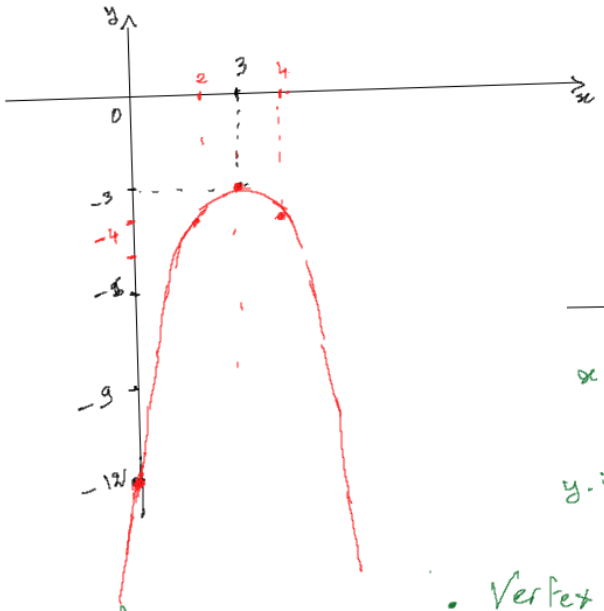
Vertex $= (3, -3)$

y-intercept $= (0, -12)$

x-intercepts: $y = 0 \Leftrightarrow (x-3)^2 + 3 = 0$.
no solution.

Two more points : $(4, -4)$, $(2, -4)$

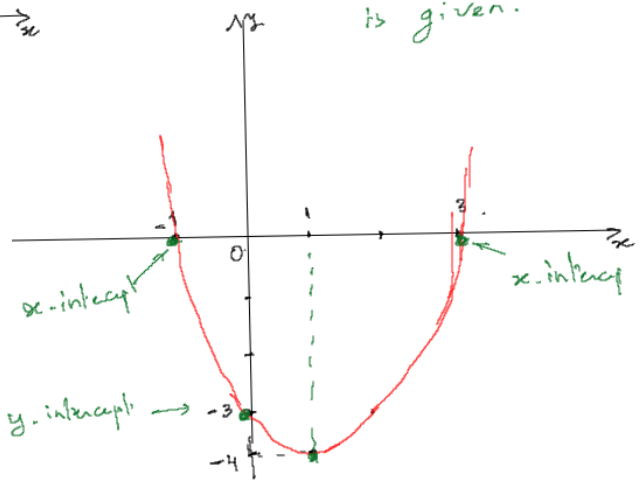
$\max_{\mathbb{R}} f = -3 = f(3)$; $\min_{\mathbb{R}} f = DNE$.



- Equation $y = a(x-1)^2 + (-4)$.
- with $x = 0$; $y = -3 = a - 4$
  then $a = 4 - 3 = 1$.

$$y = (x-1)^2 - 4$$

Ex 2: The graph of a parabola is given.



- Vertex : $(1, -4)$
- y-intercept: $(0, -3)$.
- x-intercepts : $(-1, 0)$, $(3, 0)$
- $\max_{\mathbb{R}} f = DNE$

$\min_{\mathbb{R}} f = -4 = f(1)$