Ex Graph, Identify the vertex, Axis of symmetry, & intercepts
Find Domain, range, & where f is increasing or decreasing.

$$f(x) = -3x^2 + 6x - 4$$

method 1: vertex Form

$f(x) + 4 = -3x^2 + 6x$

$f(x) + 4 = -3(x^2 - 2x + \boxed{1})$ * $C = \left(\frac{b}{2}\right)^2$

$f(x) + 4 - 3 = -3(x-1)^2$ $\quad C = \left(\frac{-2}{2}\right)^2 = 1$

$f(x) + 1 = -3(x-1)^2$

$f(x) = -3(x-1)^2 - 1$ ⇒ vertex Form

vertex $(1, -1)$

Axis of symmetry (AOS) → $x = 1$

y-int → $f(0)$ → $(0, -4)$

x-int → factor, use quadratic Formula, or solve From vertex Form

$$x = \frac{-6 \pm \sqrt{(6)^2 - 4(-3)(-4)}}{2(-3)}$$

$$x = \frac{-6 \pm \sqrt{-12}}{-6}$$

NO x-intercepts
(can't take square root of a neg. # & get a real solution)

method 2: Standard Form

$f(x) = -3x^2 + 6x - 4$

Axis of symmetry → $x = \frac{-b}{2a}$

vertex → $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

Axis of symmetry → $x = \frac{-6}{2(-3)} = 1$

$x = 1$

Vertex → $(1, f(1)) = (1, -1)$

y-int → $f(0)$ → $(0, -4)$

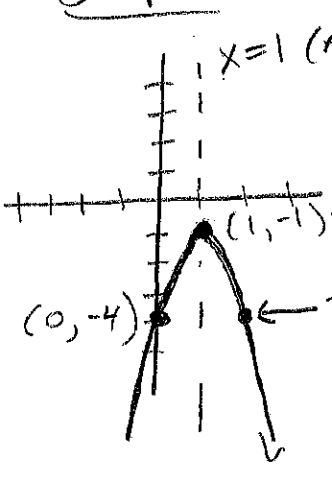
x-int → factor or use quadratic formula

* $b^2 - 4ac$ → Discriminant

$(6)^2 - 4(-3)(-4) = -12 < 0$

therefore, no x-intercepts

Graph



To get this point move 1 space to the (R) of Axis of symmetry where it is intersected by $y = -4$ (y-intercept), b/c $(0,-4)$ would be 1 to the (L) of Axis of sym at $y = -4$