

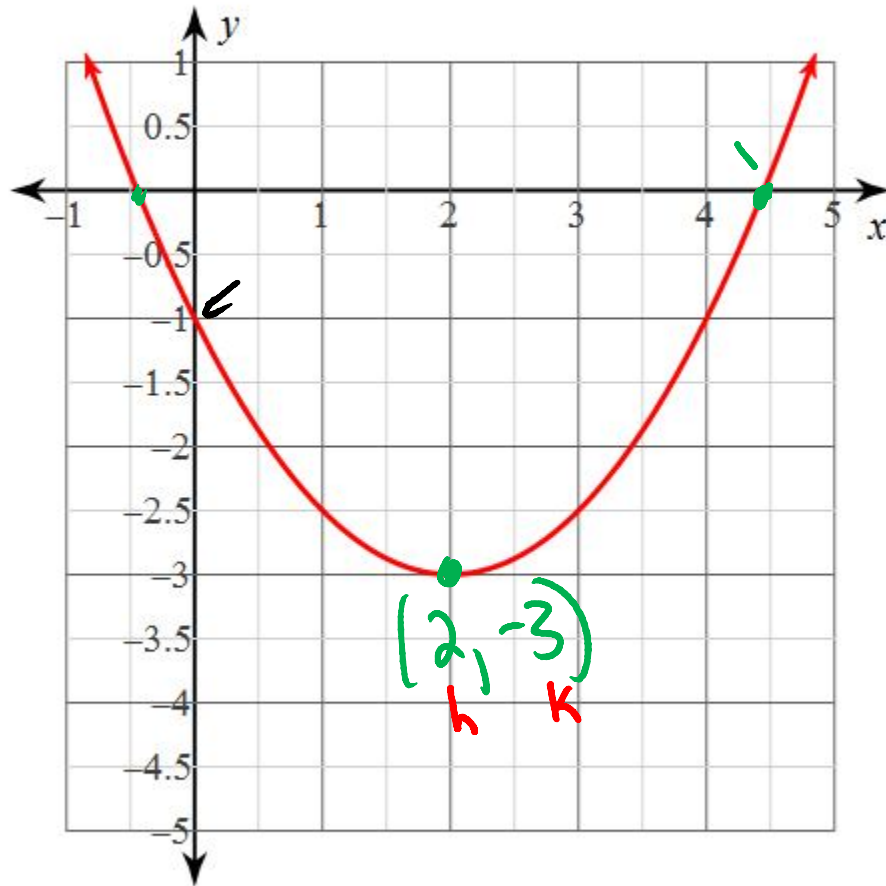
Mathematics 10D

Q.03 – Vertex Form

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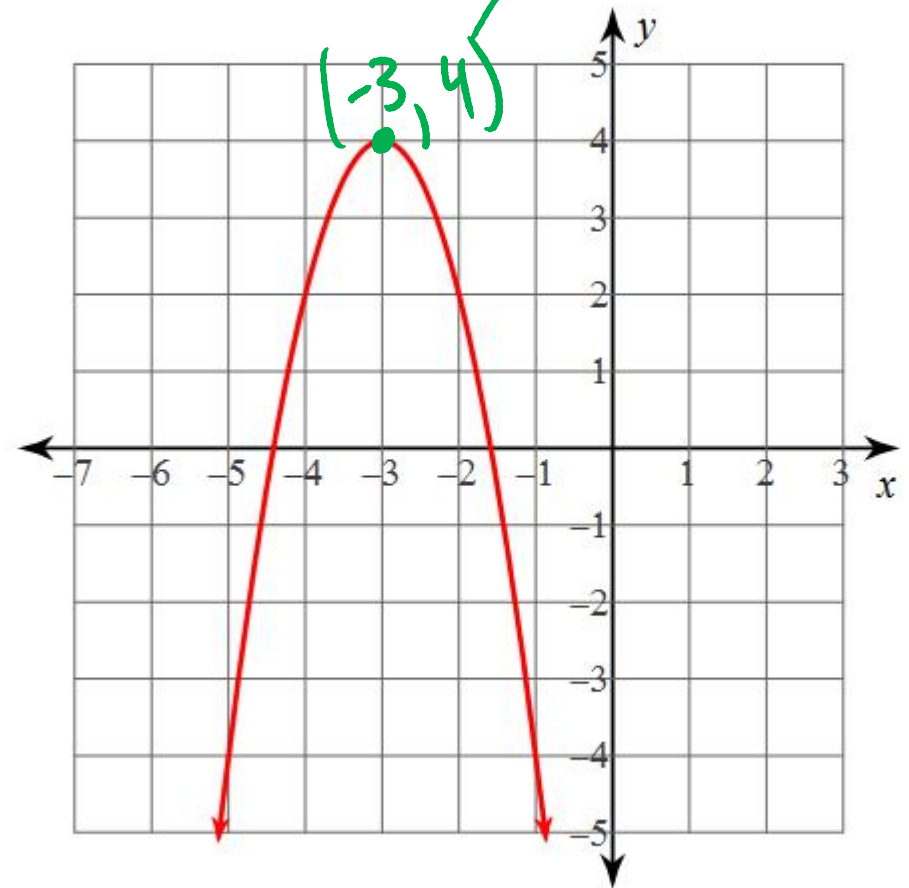
$$y = \frac{1}{2}(x - 2)^2 - 3$$

Handwritten red annotations: a bracket around 2 with an arrow pointing to it, a bracket around -3, and a red 'k' next to it.



$$y = -2(x + 3)^2 + 4$$

Handwritten green annotations: $(x - -3)^2$ above the equation and an arrow pointing from the vertex (-3, 4) to the term $(x + 3)^2$.



Vertex form: $y = a(\underline{x - h})^2 + k$

Convert from Vertex form to Standard form

$$y = \frac{1}{2}(x - 2)^2 - 3 \quad (2, -3)$$

$$y = \frac{1}{2}(x - 2)(x - 2) - 3$$

$$y = \frac{1}{2}(x^2 - 2x - 2x + 4) - 3$$

$$\rightarrow y = \frac{1}{2}(x^2 - 4x + 4) - 3$$

$$y = \frac{1}{2}x^2 - 2x + 2 - 3$$

$$y = \frac{1}{2}x^2 - 2x - 1$$

$$y = -2(x + 3)^2 + 4$$

$$y = -2(x + 3)(x + 3) + 4$$

$$y = -2(x^2 + 3x + 3x + 9) + 4$$

$$y = -2(x^2 + 6x + 9) + 4$$

$$y = -2x^2 - 12x - 18 + 4$$

$$y = -2x^2 - 12x - 14$$

Convert from Standard form to Vertex form → put into zeros form

$$y = 4x^2 + 24x - 64$$

$$y = 4(x^2 + 6x - 16) \begin{matrix} \textcircled{2} -16 \\ \textcircled{+} +6 \end{matrix} +8, -2$$

$$y = 4(x - 2)(x + 8)$$

Zeros: $x = 2$ and $x = -8$

$$h = \frac{2 + (-8)}{2} = \frac{-6}{2} = \boxed{-3}$$

$$k = 4(-3)^2 + 24(-3) - 64$$

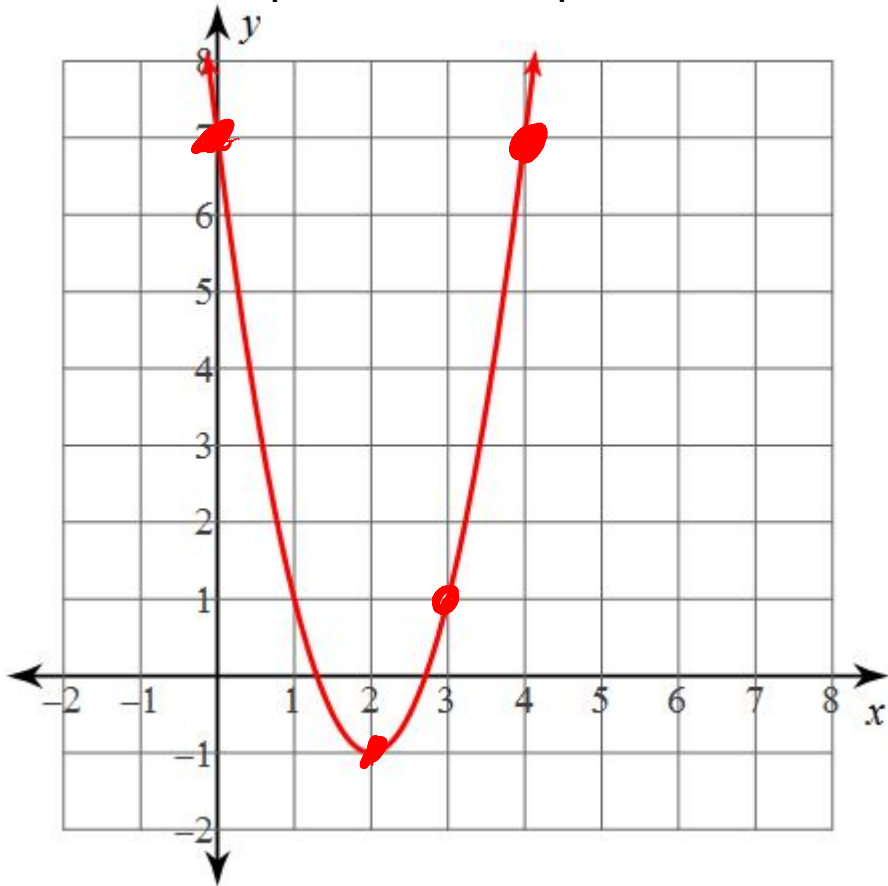
$$k = 36 - 72 - 64$$

$$k = -100$$

$$y = a(x - h)^2 + k$$

$$y = 4(x + 3)^2 - 100$$

Write the equation of the parabola in vertex form



$$h = 2$$

$$k = -1$$

$$x = 4$$

$$y = 7$$

$$y = a(x-h)^2 + k$$

$$7 = a(4-2)^2 - 1$$

$$8 = a(2)^2$$

$$8 = a(4)$$

$$2 = a$$

$$\therefore y = 2(x-2)^2 - 1$$

A parabola has a zero at (3,0) and a vertex at (5,12). State the equation of the parabola in both vertex and standard form.

$$h = 5$$

$$k = 12$$

$$x = 3$$

$$y = 0$$

$$y = a(x-h)^2 + k$$

$$0 = a(3-5)^2 + 12$$

$$-12 = a(-2)^2$$

$$-12 = a(4)$$

$$-3 = a$$

$$\therefore y = -3(x-5)^2 + 12$$

$$\begin{array}{l} -2^2 = -4 \\ (-2)^2 = 4 \\ \uparrow \\ \text{we want} \end{array}$$