

Name: \_\_\_\_\_

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Vertex form of a Quadratic Function:


$$y = a(x-p)^2 + q$$

+  $\cup$   
-  $\wedge$

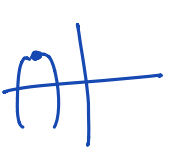
vertex  $(p, q)$

**Example** Complete the table for each of the following functions:

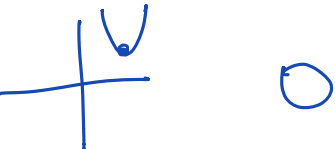
$$f(x) = 2(x-3)^2 - 4$$

1. y-intercept $(x=0)$ $y = 2(0-3)^2 - 4$ $= 2(-3)^2 - 4$ $= 2(9) - 4$ $= 18 - 4 = 14$	2. Number of x-intercepts $\textcircled{5}$ 2 	3. Equation of the axis of symmetry <i>mirror</i> $\textcircled{4}$ $x = 3$
4. Coordinates of the vertex $\textcircled{1}$ $(3, -4)$	5. Maximum or minimum? Value? $\textcircled{2}$ $y = -4$	6. Domain and Range $\textcircled{3}$ $x \in \mathbb{R}$ $y \geq -4$

$$f(x) = -2(x+5)^2 + 7$$

7. y-intercept $y = -2(0+5)^2 + 7$ $= -2(25) + 7$ $= -50 + 7$ $= -43$	8. Number of x-intercepts  $\textcircled{2}$	9. Equation of the axis of symmetry $x = -5$
10. Coordinates of the vertex $(-5, 7)$	11. Maximum or minimum? Value? $y = 7$	12. Domain and Range $x \in \mathbb{R}$ $y \leq 7$

$$f(x) = \frac{2}{3}(x - 6)^2 + 7$$

13. $y$ - intercept $y = \frac{2}{3}(0 - 6)^2 + 7$ $= \frac{2}{3}(-6)^2 + 7$ $= \frac{2}{3}(36) + 7 = 24 + 7 = 31$	14. Number of $x$ - intercepts 	15. Equation of the axis of symmetry $x = 6$
16. Coordinates of the vertex $(6, 7)$	17. Maximum or minimum? Value? $y = 7$	18. Domain and Range $x \in \mathbb{R}$ $y \geq 7$

**Example** Predict the number of zeros of each of the following functions:

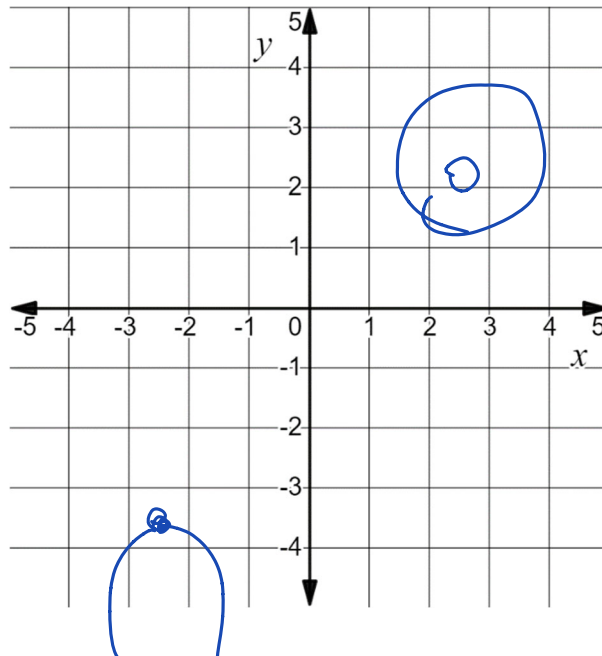
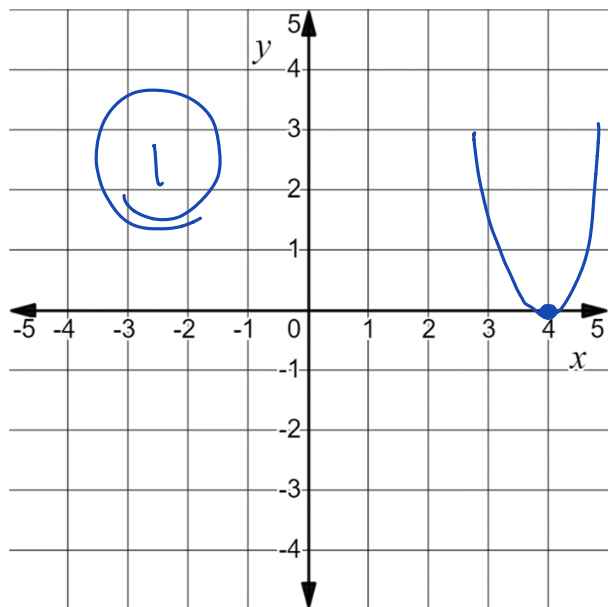
a.  $y = (x - 4)^2 + 0$

$(4, 0)$

↳  $x$ -intercepts  
↳ solutions.

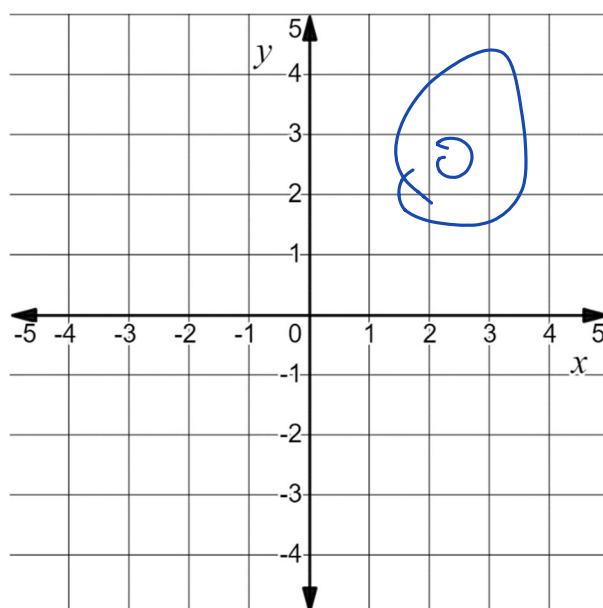
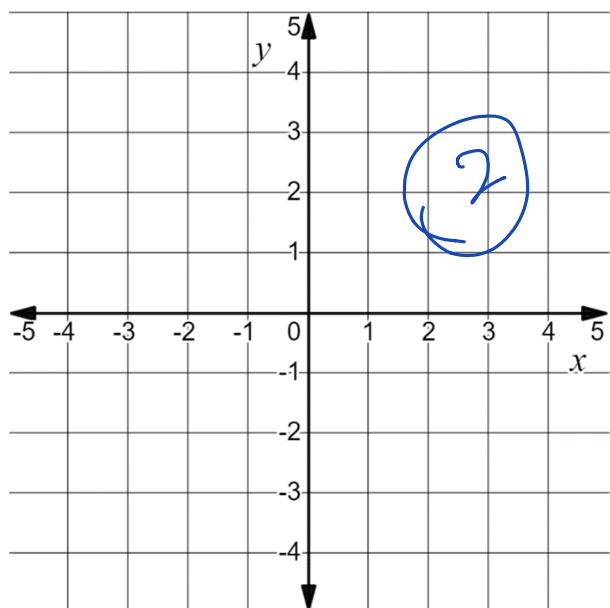
b.  $g(x) = -2(x + 4)^2 - 7$

$(-4, -7)$



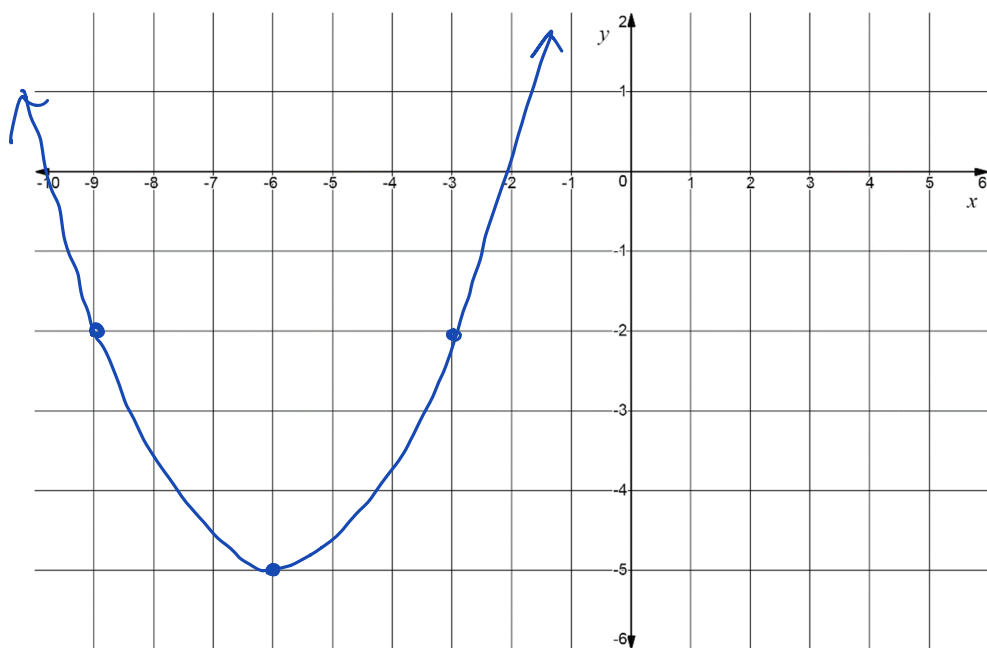
c.  $h(x) = 3(x - 7)^2 - 5$

d.  $m(x) = x^2 + 2$



**Example** Sketch the graph of  $f(x) = \frac{1}{3}(x+6)^2 - 5$ . Clearly show five points on the graph.

$$(-6, -5)$$

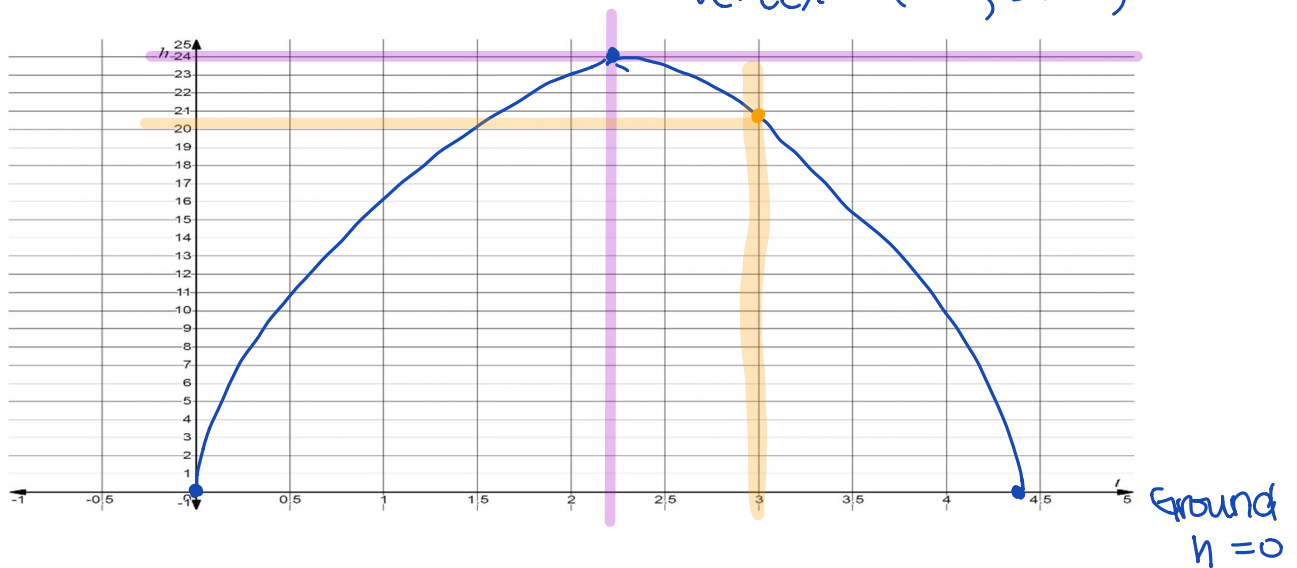


$x$	$y$
-12	7
-9	-2
-6	-5
-3	-2
0	7

$$\begin{aligned}
 f(0) &= \frac{1}{3}(0+6)^2 - 5 \\
 &= \frac{1}{3}(6)^2 - 5 \\
 &= \frac{1}{3}(36) - 5 \\
 &= 12 - 5 \\
 &= 7
 \end{aligned}$$

**Example** A goalkeeper kicked a soccer ball from the ground. It reached a maximum height of 24.2 m after 2.2 seconds. The ball was in the air for 4.4 seconds.

- a. Draw a picture to represent this situation.



- b. Write a quadratic function to model this situation.

- c. How high was the ball in the air after 3 sec?

~ 20 m above the ground

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