

Quadratic Functions

The function

- For every input number the output involves squaring a number.

eg. $y = x^2$, $y = x^2 + 3x + 1$, $y = -3(x - 5)^2$, $y = (x - 2)^2 - 1$

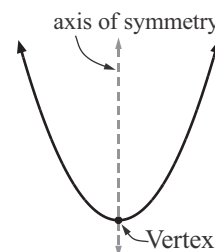
The shape

- parabola (can open up or down)



The parts

- Vertex: the maximum or minimum point on the curve
- Axis of symmetry: the line of symmetry



The equation

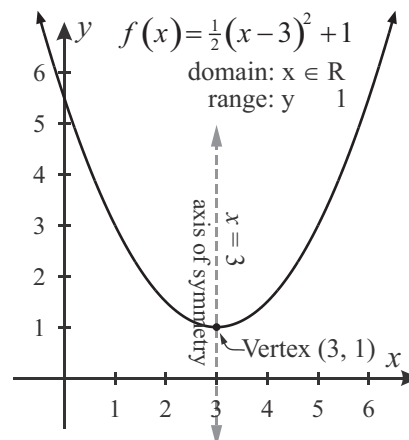
- Vertex form:** $y = a(x - p)^2 + q$

a: makes the shape _____ or _____.

It also makes the shape open _____ or _____.

Compared to $y = x^2$

- ◆ $a > 1$: _____
- ◆ $0 < a < 1$: _____
- ◆ $-1 < a < 0$: _____
- ◆ $a < -1$: _____



p: the ___-coordinate of the vertex.

Changes in **p** move the function _____ or _____

q: makes the ___-coordinate of the vertex

Changes in **q** move the function _____ or _____

x = a: the equation of the _____.

Domain: $\{x \mid \quad \quad \quad \}$

Range: $\{y \mid \quad \quad \quad, y \in R\}$ if $a > \quad$,
 $\{y \mid \quad \quad \quad, y \in R\}$ if $a < \quad$.

Minimum if _____ or Maximum if _____

Basic Problem

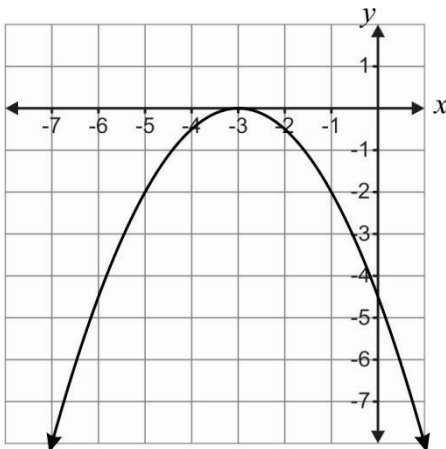
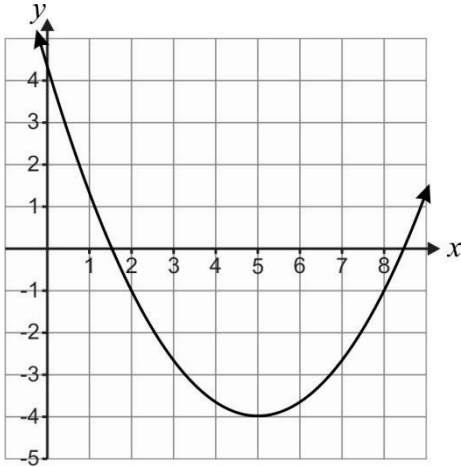
1. Determine the equation of the quadratic function given the vertex and a point on the function.

eg. a parabola has a vertex of $(3, 47)$ and goes through the point $(7, -2)$. Determine the equation of the quadratic function.

Start with $y = a(x - p)^2 + q$, replace p and q , and determine the value of a .

Thus the equation is _____.

2. Determine the equation of the function using the coordinates of the vertex and one other point.



Determine the following information:

	Vertex	Direction of opening	y-intercept	Sketch with the equation of the axis of symmetry	Number of x-intercepts
$f(x) = 0.8x^2 - 3$					
$f(x) = 2(x - 1)^2$					
$f(x) = -3(x + 2)^2 - 1$					
$f(x) = 0.5x^2 - 7$					
$f(x) = -2(x + 1)^2$					
$f(x) = -\frac{1}{6}(x - 5)^2 - 11$					

Math 20-1

ID: A

Name: _____

Quadratic Functions (Vertex Form)

1. Given the equation $y = (x + 2)^2 - 4$, determine the following:

a) y-intercept: _____

b) x-intercept(s): _____

c) vertex: _____

d) axis of symmetry: _____

e) domain: _____

f) range: _____

2. Given the equation $y = 3x^2 - 36$, determine the following:

a) y-intercept: _____

b) x-intercept(s): _____

c) vertex: _____

d) axis of symmetry: _____

e) domain: _____

f) range: _____

3. Given the equation $y = (x - 3)^2 - 1$, determine the following:

a) y-intercept: _____

b) x-intercept(s): _____

c) vertex: _____

d) axis of symmetry: _____

e) domain: _____

f) range: _____

4. Given the equation $y = 3(x + 1)^2 - 75$, determine the following:

a) y-intercept: _____

b) x-intercept(s): _____

c) vertex: _____

d) axis of symmetry: _____

e) domain: _____

f) range: _____

5. Given the equation $y = 3(x - 3)^2 + 54$, determine the following:

a) y-intercept: _____

b) x-intercept(s): _____

c) vertex: _____

d) axis of symmetry: _____

e) domain: _____

f) range: _____

6. Given the equation $y = (x + 1)^2 - 1$, determine the following:

a) y-intercept: _____

b) x-intercept(s): _____

c) vertex: _____

d) axis of symmetry: _____

e) domain: _____

f) range: _____

7. Given the equation $y = 3x^2$, determine the following:

a) y-intercept: _____

b) x-intercept(s): _____

c) vertex: _____

d) axis of symmetry: _____

e) domain: _____

f) range: _____

8. Given the equation $y = x^2 - 16$, determine the following:

a) y-intercept: _____

b) x-intercept(s): _____

c) vertex: _____

d) axis of symmetry: _____

e) domain: _____

f) range: _____

9. Given the equation $y = (x - 3)^2 - 1$, determine the following:

a) y-intercept: _____

b) x-intercept(s): _____

c) vertex: _____

d) axis of symmetry: _____

e) domain: _____

f) range: _____

10. Given the equation $y = (x - 4)^2$, determine the following:

a) y-intercept: _____

b) x-intercept(s): _____

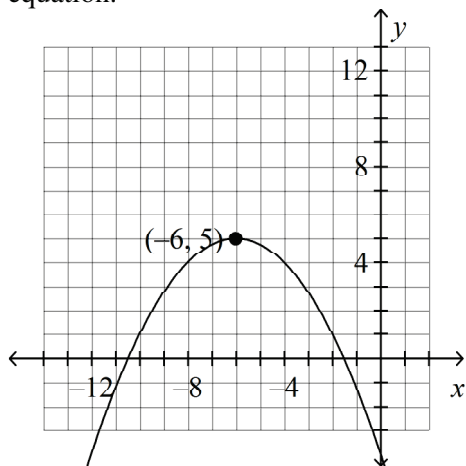
c) vertex: _____

d) axis of symmetry: _____

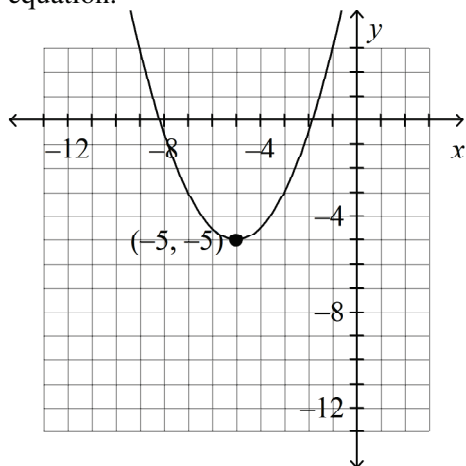
e) domain: _____

f) range: _____

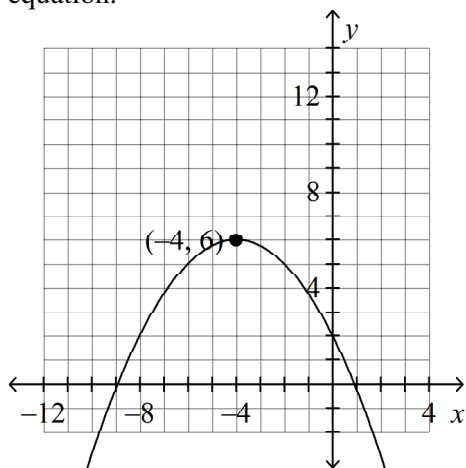
11. Given the graph of the parabola, determine the equation.



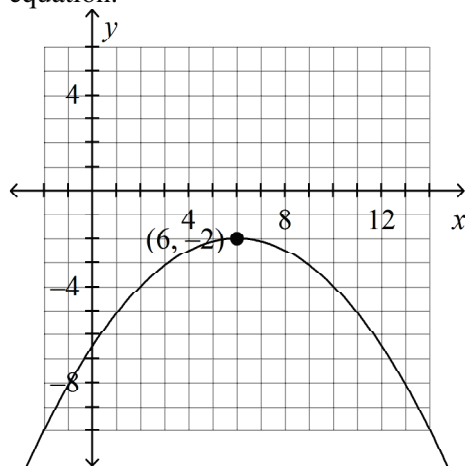
12. Given the graph of the parabola, determine the equation.



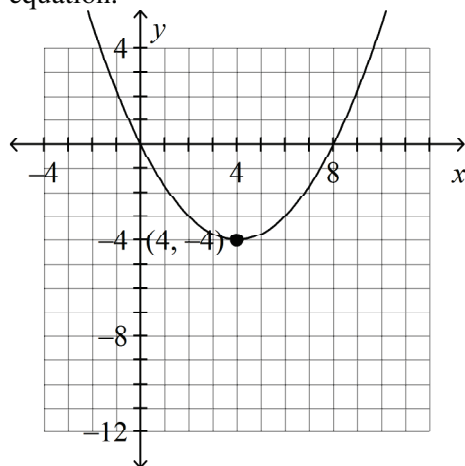
13. Given the graph of the parabola, determine the equation.



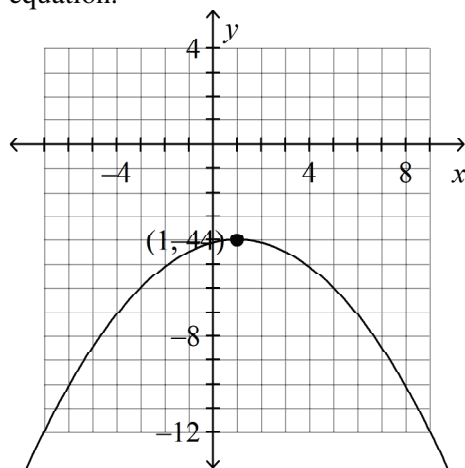
14. Given the graph of the parabola, determine the equation.



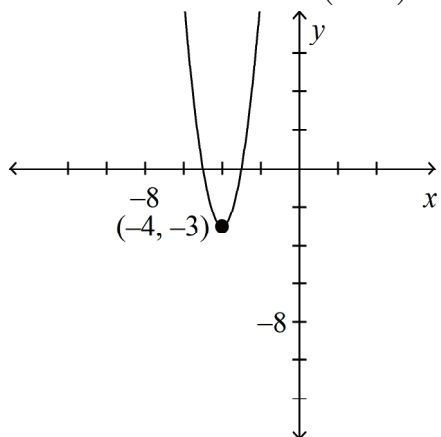
15. Given the graph of the parabola, determine the equation.



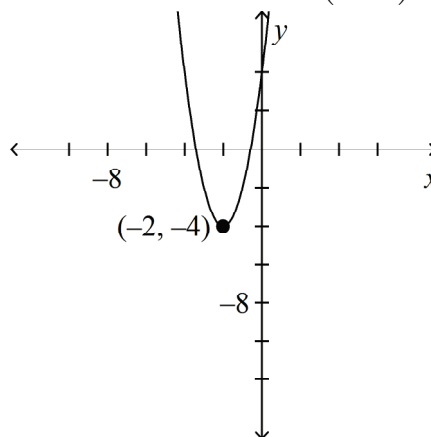
16. Given the graph of the parabola, determine the equation.



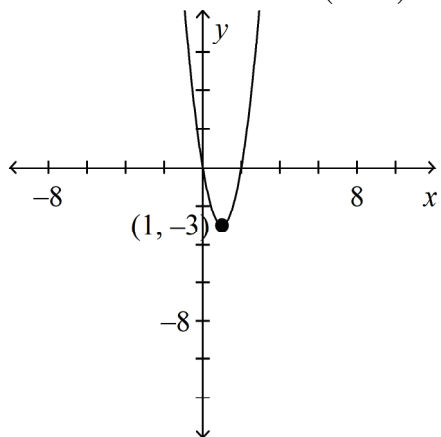
17. Given the vertex is $(-4, -3)$ and a point on the graph is $(1, 72)$. Determine the equation of the parabola in the form $y = a(x - p)^2 + q$ [2 marks]



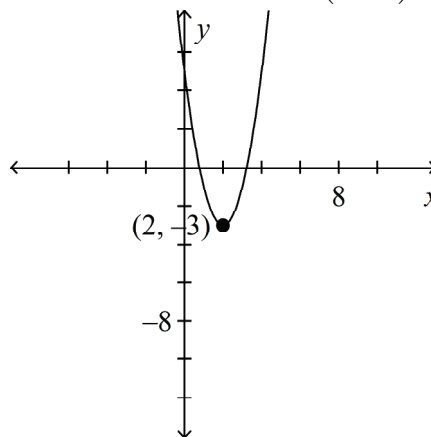
19. Given the vertex is $(-2, -4)$ and a point on the graph is $(0, 4)$. Determine the equation of the parabola in the form $y = a(x - p)^2 + q$ [2 marks]



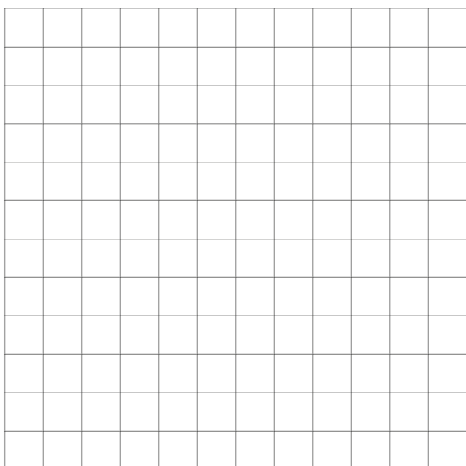
18. Given the vertex is $(1, -3)$ and a point on the graph is $(6, 72)$. Determine the equation of the parabola in the form $y = a(x - p)^2 + q$ [2 marks]



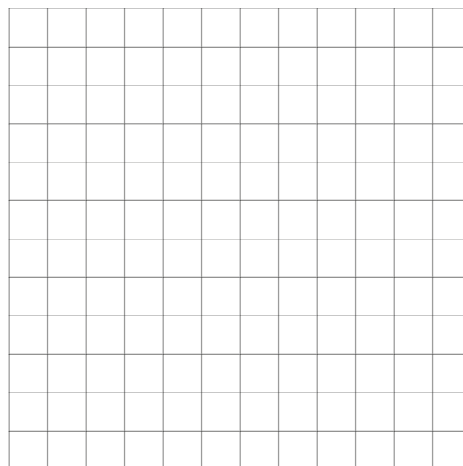
20. Given the vertex is $(2, -3)$ and a point on the graph is $(7, 47)$. Determine the equation of the parabola in the form $y = a(x - p)^2 + q$ [2 marks]



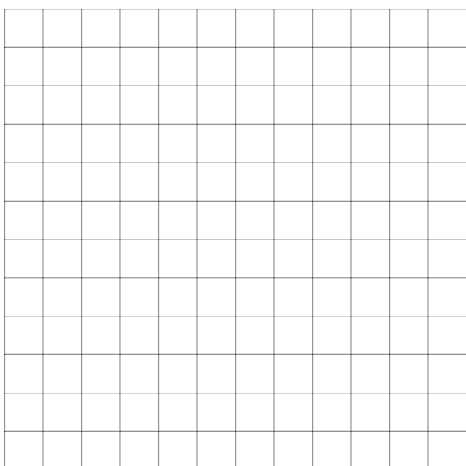
21. Accurately graph $y = (x+6)^2 + 1$.
Indicate the vertex on the graph.



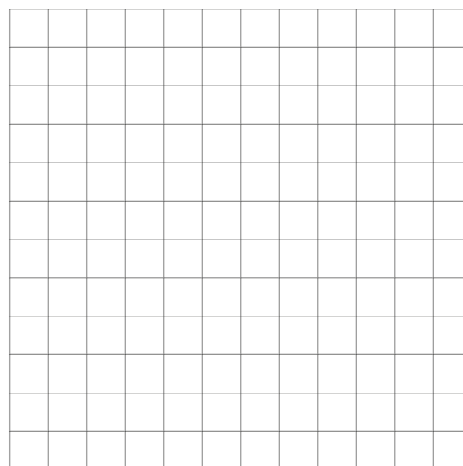
23. Accurately graph $y = (x-6)^2 + 2$.
Indicate the vertex on the graph.



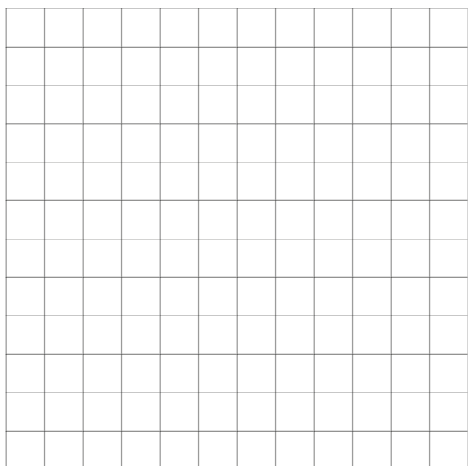
22. Accurately graph $y = (x-1)^2 + 2$.
Indicate the vertex on the graph.



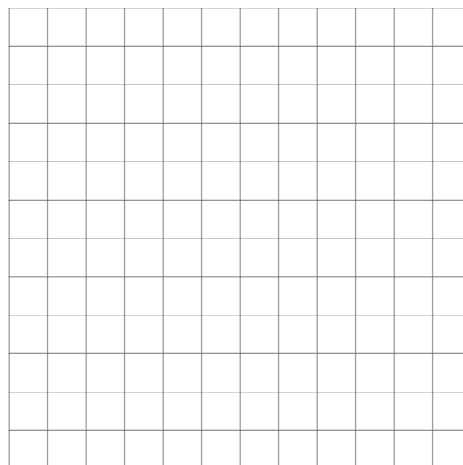
24. Accurately graph $y = (x+6)^2 + 4$.
Indicate the vertex on the graph.



25. Accurately graph $y = 2(x - 3)^2 + 4$.
Indicate the vertex on the graph.



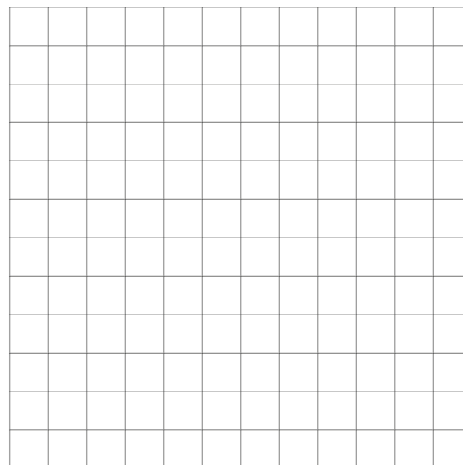
27. Accurately graph $y = \frac{1}{8}(x - 4)^2 - 2$.
Indicate the vertex on the graph.



26. Accurately graph $y = -\frac{1}{2}(x + 6)^2 + 3$.
Indicate the vertex on the graph.



28. Accurately graph $y = -2(x + 4)^2 + 1$.
Indicate the vertex on the graph.



Quadratic Functions (Vertex Form)

Answer Section

1. a) 0
b) $-4, 0$
c) $(-2, -4)$
d) $x = -2$
e) $x \in \mathbb{R}$
f) $y \geq -4$
2. a) -36
b) $-2, 2$
c) $(0, -36)$
d) $x = 0$
e) $x \in \mathbb{R}$
f) $y \geq -36$
3. a) 8
b) $2, 4$
c) $(3, -1)$
d) $x = 3$
e) $x \in \mathbb{R}$
f) $y \geq -1$
4. a) -72
b) $2, -4$
c) $(-1, -75)$
d) $x = -1$
e) $x \in \mathbb{R}$
f) $y \geq -75$
5. a) 81
b) none
c) $(3, 54)$
d) $x = 3$
e) $x \in \mathbb{R}$
f) $y \geq 54$
6. a) 0
b) $-2, 0$
c) $(-1, -1)$
d) $x = -1$
e) $x \in \mathbb{R}$
f) $y \geq -1$

7. a) 0
b) 0
c) $(0, 0)$
d) $x = 0$
e) $x \in \mathbb{R}$
f) $y \geq 0$
8. a) -16
b) $4, -4$
c) $(0, -16)$
d) $x = 0$
e) $x \in \mathbb{R}$
f) $y \geq -16$
9. a) 8
b) $4, 2$
c) $(3, -1)$
d) $x = 3$
e) $x \in \mathbb{R}$
f) $y \geq -1$
10. a) 16
b) 4
c) $(4, 0)$
d) $x = 4$
e) $x \in \mathbb{R}$
f) $y \geq 0$
11. $y = -\frac{1}{4}(x+6)^2 + 5.$
12. $y = \frac{1}{2}(x+5)^2 - 5.$
13. $y = -\frac{1}{4}(x+4)^2 + 6.$
14. $y = -\frac{1}{8}(x-6)^2 - 2.$
15. $y = \frac{1}{4}(x-4)^2 - 4.$
16. $y = -\frac{1}{8}(x-1)^2 - 4.$
17. $y = 3(x+4)^2 - 3$
18. $y = 3(x-1)^2 - 3$
19. $y = 2(x+2)^2 - 4$
20. $y = 2(x-2)^2 - 3$

