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POPULAR CANADA

Graphs of Quadratic Relations

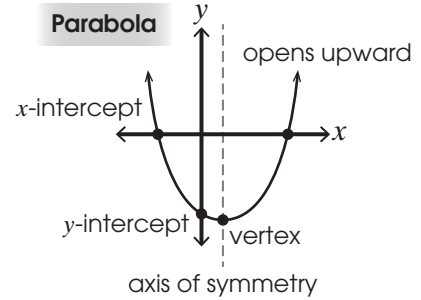


Words TO LEARN

Parabola: a graph of a quadratic relation that is shaped like the letter “U”

Axis of symmetry: a line that divides a parabola into two equal halves

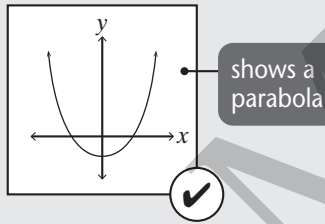
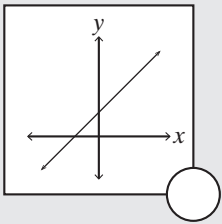
Vertex: the highest or lowest point of a parabola



5.1 Properties of Quadratic Relations

Example

Identify and check the representations of quadratic relations.

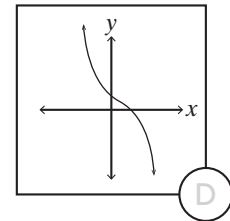
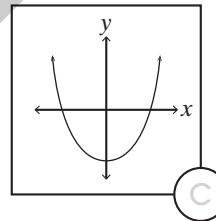
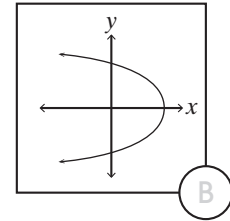
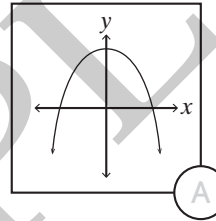


x	y
-2	8
-1	4
0	0
1	4
2	8

x	y
-2	-3
-1	0
0	5
1	12
2	21

second differences are constant but not 0

Try This



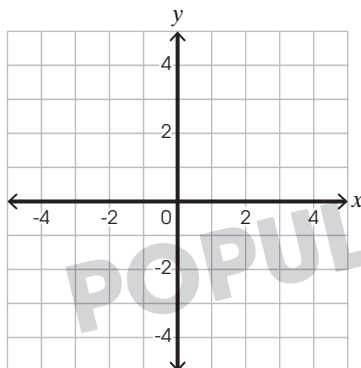
x	y
-2	59
-1	11
0	-5
1	11
2	59

x	y
-2	-2
-1	1
0	-2
1	1
2	4

Graph the quadratic relations.

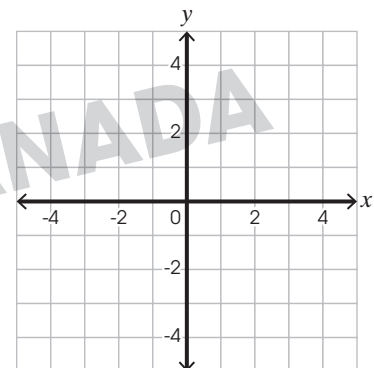
① $y = x^2$

x	y
-2	
-1	
0	
1	
2	



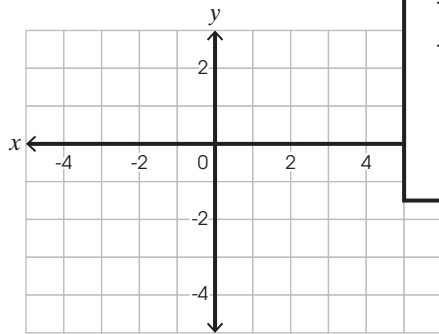
② $y = -2x^2 + 4$

x	y
-2	
-1	
0	
1	
2	



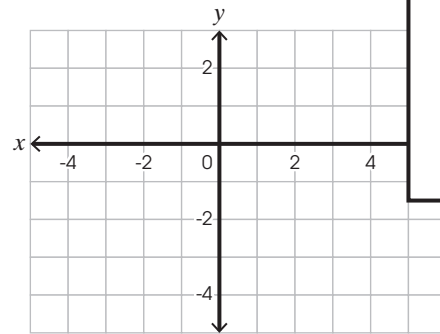
Graph the quadratic relations. Write the key characteristics of each in the table.

③ $y = x^2 - 4$



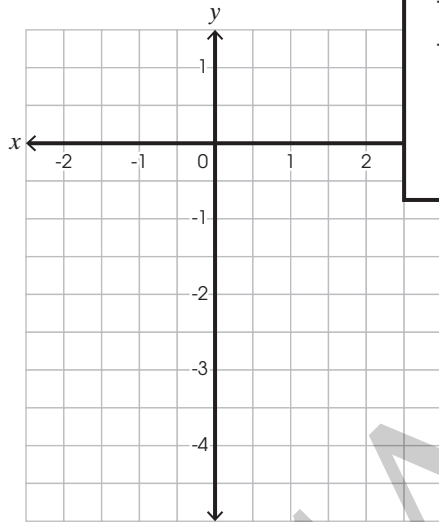
x	y
-2	
-1	
0	
1	
2	

④ $y = -x^2 + x + 2$



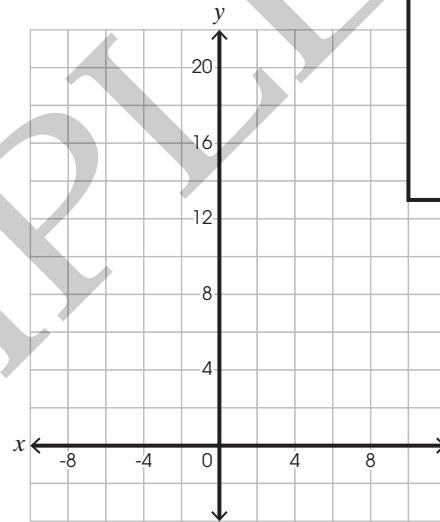
x	y
-2	
-1	
0	
1	
2	

⑤ $y = -\frac{1}{2}(x - 1)^2$



x	y
-2	
-1	
0	
1	
2	

⑥ $y = 2(x + 1)^2 + 2$



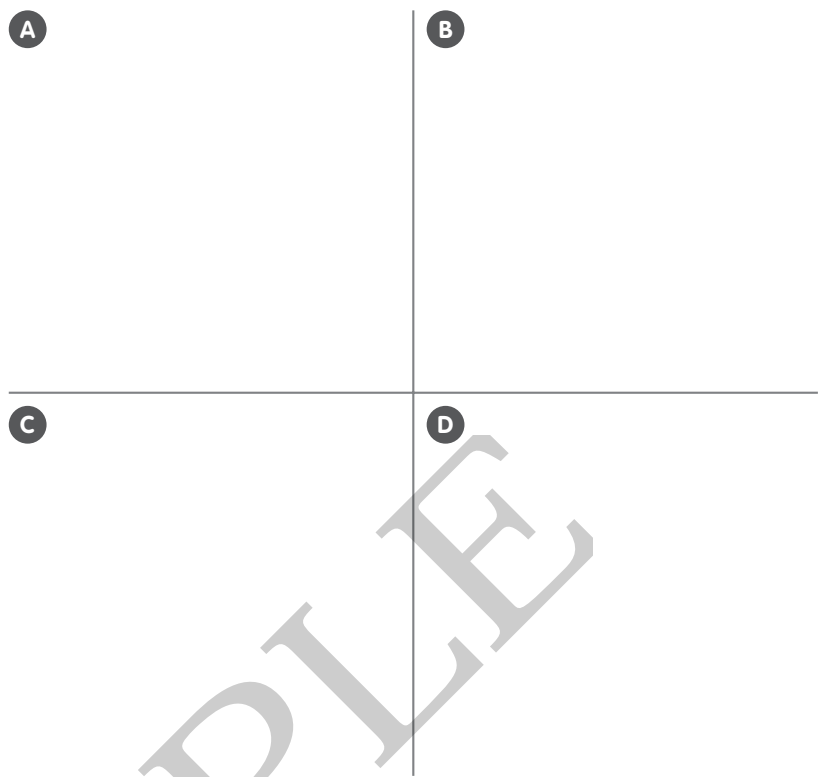
x	y
-2	
-1	
0	
1	
2	

	$y = x^2 - 4$	$y = -x^2 + x + 2$	$y = -\frac{1}{2}(x - 1)^2$	$y = 2(x + 1)^2 + 2$
x-intercept(s)	(____, ____)(____, ____)			
y-intercept	(____, ____)			
Direction of Opening	_____			
Axis of Symmetry	$x =$ _____			
Vertex	(____, ____)			
Max./Min. Value	$y =$ _____			



Sketch the parabolas with the given characteristics.

- ⑦
- A vertex: $(-3,0)$
y-intercept: $(0,1)$
 - B x-intercept: $(1.5,0)$
y-intercept: $(0,-6)$
 - C no x-intercepts
opens upward
 - D x-intercepts: $(2,0), (-2,0)$
max. value: 3



Answer the questions without graphing.

- ⑧ $y = x^2 + 7$
- a. What is the direction of opening?

- b. What is the y-intercept?

- ⑨ $y = x^2 - 16x + 63$
- a. What is the direction of opening?

- b. Will there be a maximum value or a minimum value?

- ⑩ $y = -2(x - 1)^2$ ← Expand and rewrite in the form: $y = ax^2 + bx + c$.
- a. What is the direction of opening? _____
- b. What is the y-intercept? _____



HINT

Standard Form of Quadratic Relations

$$y = ax^2 + bx + c$$

↑
↑
 direction of opening y-intercept

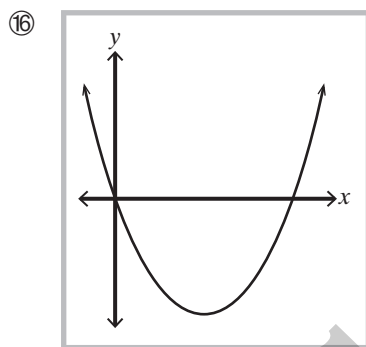
- $a > 0$, upward
- $a < 0$, downward

e.g. $y = x^2 + 1$ $y = -x^2 + 1$

Circle T for true and F for false.

- ⑪ The axis of symmetry is always the y -axis. T / F
- ⑫ The vertex always lies on the axis of symmetry. T / F
- ⑬ A parabola with no x -intercepts and with a positive y -intercept always opens upward. T / F
- ⑭ All parabolas have y -intercepts. T / F
- ⑮ Consider $y = ax^2 + bx + c$.
- a. If it is an equation of a parabola, then a cannot be 0. T / F
- b. If a is negative, the parabola will open downward. T / F
- c. c is the y -intercept. T / F

Study each scenario and answer the questions.

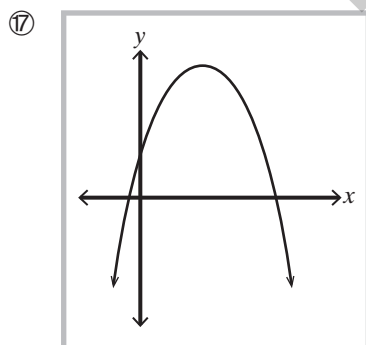


The graph shows the path made by Steven's dive.

a. Check the equation that represents the graph where x represents the horizontal distance and y represents the water depth.

- Ⓐ $y = 0.1x^2 + 8$ Ⓑ $y = 0.1x^2 - 2x$ Ⓒ $y = -0.2x^2 - x$

b. What was the maximum water depth Steven reached?



The graph shows the water arch Karen's garden hose made while she watered her plants.

a. Check the equation that represents the graph where x represents the horizontal distance and y represents the height.

- Ⓐ $y = 2x^2 + 5$ Ⓑ $y = -0.5x^2 - 1$ Ⓒ $y = -0.6x^2 + 2.7x + 1.5$

b. How far away was Karen from the plants?
