

Quadratic Functions and Parabolas – Intermediate Algebra

Definition – A quadratic function can be written in the standard form or vertex form of a quadratic.

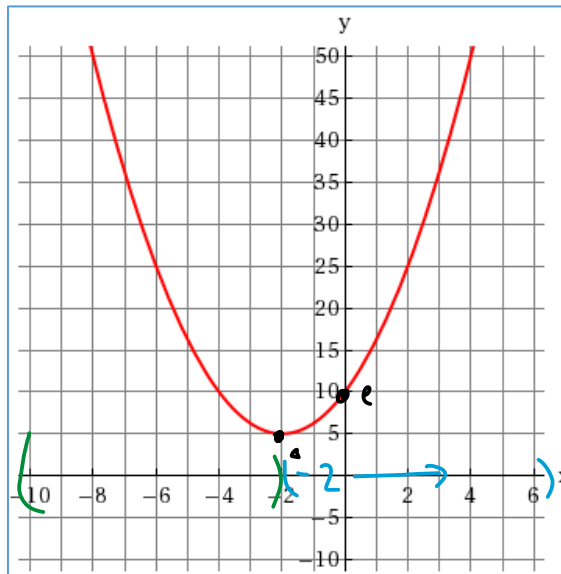
Standard Form: $f(x) = ax^2 + bx + c$ where a , b , and c are real numbers and $a \neq 0$.

Vertex Form: $f(x) = a(x-h)^2 + k$ where a , h , and k are real numbers and $a \neq 0$.

Fact: The vertex of a quadratic function represents the turning point of the graph of the function which has the shape of a parabola. The parabola can open either up or down. Other words to indicate vertex include: maximum/minimum, highest/lowest, greatest/least, largest/smallest.

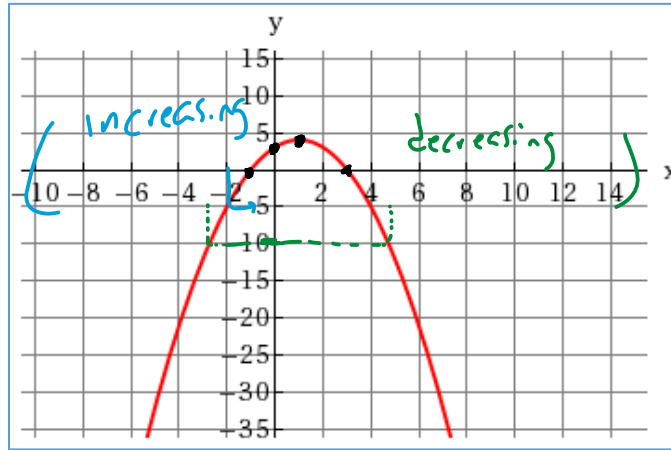
Examples:

1. Use the graph to estimate the following.



- a. Vertex $(-2, 5)$
- b. For what x-values is the graph increasing? $(-2, \infty)$
- c. For what x-values is the graph decreasing? $(-\infty, -2)$
- d. Horizontal intercept(s) *None*
- e. Vertical intercept. $(0, 10)$

2. Use the graph to estimate the following.



- a. Vertex $(1, 4)$
- b. For what x-values is the graph increasing? $(-\infty, 1)$
- c. For what x-values is the graph decreasing? $(1, \infty)$
- d. Horizontal intercept(s) $(-1, 0)$ & $(3, 0)$ alternatively $x = \boxed{-1, 3}$
- e. Vertical intercept. $(0, 3)$
- f. $f(-2) = -5$
- g. What x-value(s) will make $f(x) = -10$? $x = -3, 5$
 $x = -2.75, 4.75$

3. Use the table to find vertical and horizontal intercepts.

a.

horiz	Input x	-2	0	2	3	4	6	7
vert	Output y	20	9	2	0	-1	0	2

vertical intercept $(0, 9)$

horiz. intercepts $(3, 0)$ and $(6, 0)$

b. .

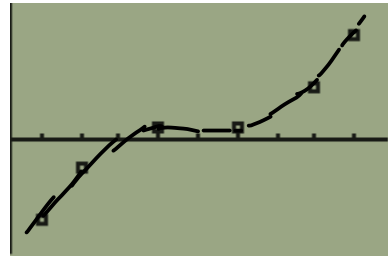
Input	-2	0	2	4	6	8
Output	180	80	20	0	20	80

horiz int. $(4,0)$ vertical int $(0,80)$

4. Create a scatterplot for the given set of data and determine what type of model (linear, quadratic, or other) would best fit the data. If quadratic, give an estimate of the vertex and determine whether it is a maximum or minimum.

a.

Input	Output
1	-57
2	-20
4	6
6	8
8	34
9	71



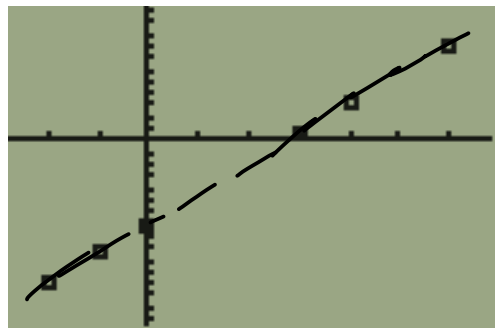
Other

b. .

Input	Output
-2	-12
-1	-9.5
0	-7
3	0.5
4	3
6	8

↘ 2.5
↘ 2.5
↘ 2.5

linear $m = 2.5$



c.

Input	Output
-5	-48
-3	8
-2	15
-1	8
1	-48
2	-97

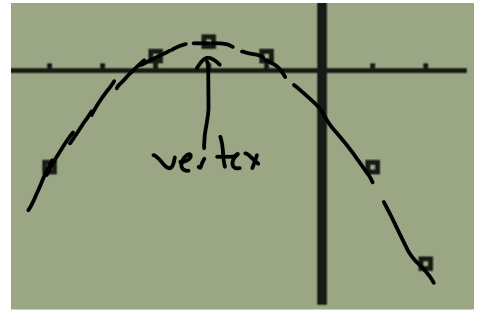
-48

8

8

-48

vertex
(-2, 15)



quadratic