College Algebra / Module 5 - Quadratic Graphs

Module 5 - Quadratic Graphs

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Topic 1: Evaluating functions: Linear and quadratic or cubic

1. Evaluate the function $f(x) = 2x^2 - 3x + 1$ when $x = 2$.

$f(2) = 2(2)^2 - 3(2) + 1$

$8 - 6 + 1$

$f(2) = 3$

$(2, 3)$

1. Evaluate the function $f(x) = x^3 + 4x - 5$ when $x = -1$.

Intro

Relation - any set of ordered pairs (x, y)

Function - a relation where every x has exactly one y

Domain - 1st element x

Range - 2nd element y

Topic 2: Domain and range from ordered pairs

1. Find the domain and range of the set of ordered pairs {(-2, 3), (0, 5), (1, -1), (3, 4)}.

D: $\{-2, 0, 1, 3\}$

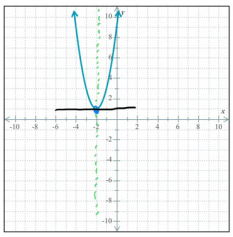
R: $\{3, 5, -1, 4\}$

Is a function

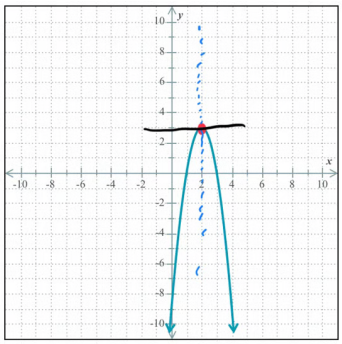
$-2 \to 3$
$0 \to 5$
$1 \to -1$
$3 \to 4$

1. Find the domain and range of the set of ordered pairs {(-1, 0), (2, 7), (4, 2), (5, -3)}.

Topic 3: Domain and range from the graph of a quadratic function



Parabola
Vertex (-2, 1)
axis of symmetry x = -2
(x) Domain (-∞, ∞)
How far left → right
(y) Range [1, ∞)
How far down → up
min/max



Vertex: (2, 3)
axis of sym.: x = 2
min/max: max at 2 is 3
D: (-∞, ∞)
R: (-∞, 3]

Topic 4: Graphing a parabola of the form y = ax²

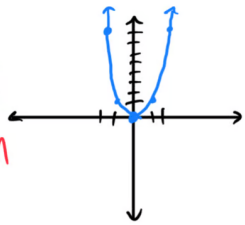
1. Graph the parabola y = 2x².

a = 2 opens up

$y = 2x^2$

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

$y = ax^2 + bx + c$
$y = a(x-h)^2 + k$
a > 0 open up ∪
a < 0 open down ∩



1. Graph the parabola y = -3x².

Topic 5: Graphing a function of the form f(x) = ax² + c

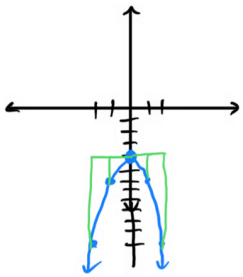
1. Graph the function f(x) = x² + 3.

1. Graph the function f(x) = -2x² - 4.

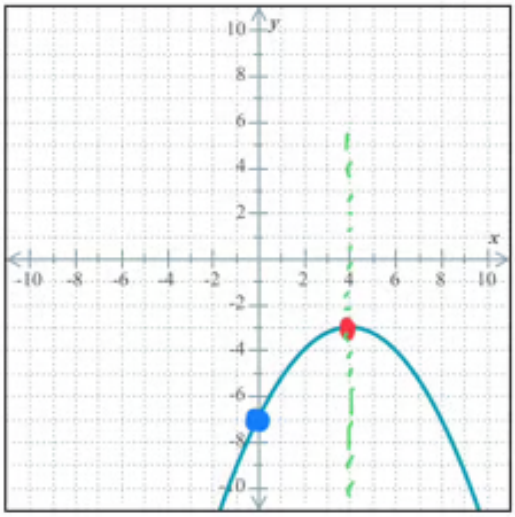
a = -2 opens down ∩

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

x	y
-2	-12
-1	-6
0	-4
1	-6
2	-12



Topic 6: Finding the vertex, intercepts, and axis of symmetry from the graph of a parabola



(a) Does the parabola open upward or downward?

○ upward ● downward

(b) Find the equation of the axis of symmetry.

equation of axis of symmetry: $x = 4$

(c) Find the coordinates of the vertex.

vertex: $(4, -3)$

(d) Find the intercept(s).

For both the x- and y-intercept(s), make sure to do the following.

- If there is more than one, separate them with commas.
- If there are none, select "None".

x-intercept(s): None

y-intercept(s): -7

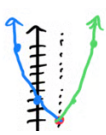
Topic 7: Graphing a parabola of the form $y = a(x-h)^2 + k$

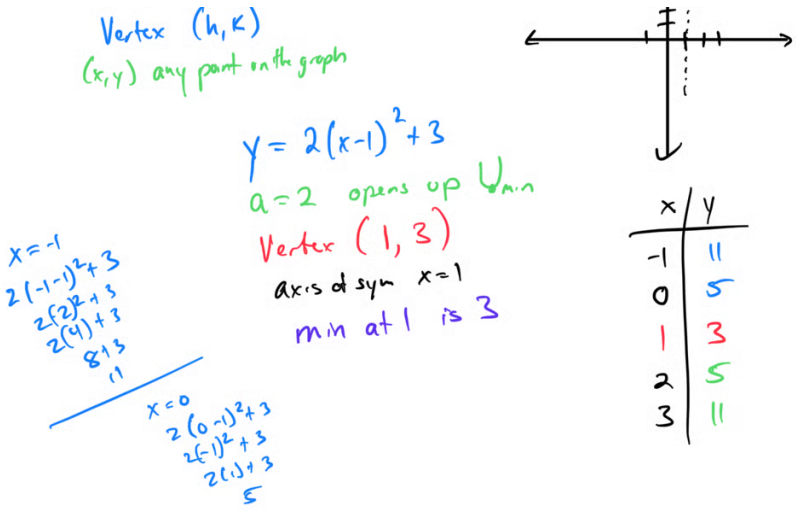
1. Graph the parabola $y = 2(x - 1)^2 + 3$.

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

$a > 0$ opens up ∪

$a < 0$ opens down ∩





1. Graph the parabola $y = -(x + 2)^2 - 1$.

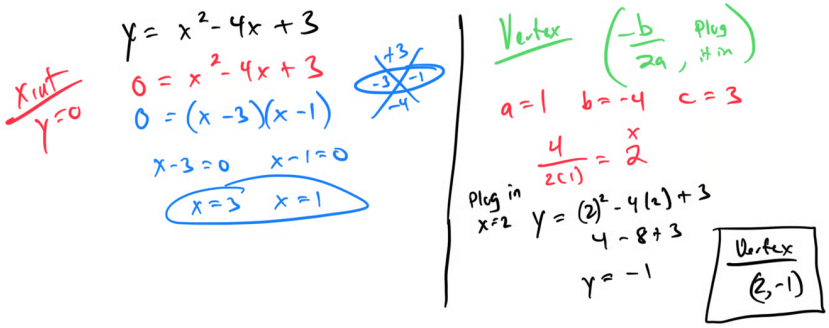
Topic 8: Graphing a parabola of the form $y = ax^2 + bx + c$: Integer coefficients

1. Graph the parabola $y = x^2 + 2x - 3$.

1. Graph the parabola $y = 2x^2 - 4x + 1$.

Topic 9: Finding the x-intercept(s) and the vertex of a parabola

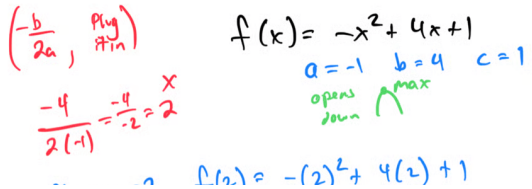
1. Find the x-intercepts and vertex of the parabola $y = x^2 - 4x + 3$.



1. Find the x-intercepts and vertex of the parabola $y = 2x^2 + 4x - 6$.

Topic 10: Finding the maximum or minimum of a quadratic function

1. Find the maximum or minimum value of the quadratic function $f(x) = -x^2 + 4x + 1$.



Plug m x=2 $-4+8+1$ $f(2)=5$ Vertex $(2,5)$ max at 2 is 5

1. Find the maximum or minimum value of the quadratic function f(x) = 2x² - 8x + 3.

Topic 11: Word problem involving the maximum or minimum of a quadratic function

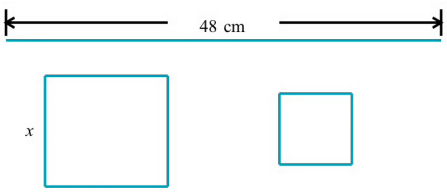
A medical equipment industry manufactures X-ray machines. The unit cost C (the cost in dollars to make each X-ray machine) depends on the number of machines made. If x machines are made, then the unit cost is given by the function $C(x)=0.4x^2-272x+54{,}806$. How many machines must be made to minimize the unit cost?

Do not round your answer.

Topic 12: Word problem involving optimizing area by using a quadratic function

A wire that is 48 centimeters long is shown below.
The wire is cut into two pieces, and each piece is bent and formed into the shape of a square.

Suppose that the side length (in centimeters) of one square is x, as shown below.



Topic 13: Domain and range from the graph of a quadratic function

Topic 14: Range of a quadratic function

1. Find the range of the quadratic function f(x) = x² - 2x + 1.

Vertex $\left(\frac{-b}{2a}, \text{plug it in}\right)$ $f(x)=x^2-2x-1$ $a=1$ $b=-2$ $c=-1$ $\frac{2}{2(1)}=x$ $x=1$ plug in $x=1$ $f(1)=1^2-2(1)-1$ $1-2-1$ $f(1)=-2$ $(1,-2)$ $a=1$ opens up ∪ min Range $[-2,\infty)$

1. Find the range of the quadratic function f(x) = -2x² + 4x - 3.

Topic 15: Choosing a quadratic model and using it to make a prediction

Topic 16: Finding the zeros of a quadratic function given its equation

1. Find the zeros of the quadratic function f(x) = x² - 5x + 6.

1. Find the zeros of the quadratic function $f(x) = 2x^2 + x - 3$.