DO NOW: Find the axis of symmetry and the vertex of the following quadratic equation by completing the square.

$y = -2x^2 - 12x - 22$

$\frac{-2}{-2} \quad \frac{-12}{-2} \quad \frac{-22}{-2}$

$\left(\frac{b}{2}\right)^2$

$\left(\frac{6}{2}\right)^2 = 9$

$y = -2(x^2 + 6x + 11)$

$y = -2(x^2 + 6x + 9 + 11 - 9)$

$y = -2(x+3)^2 + 2$

AOS $x = -3$

Vertex $(-3, 2)$

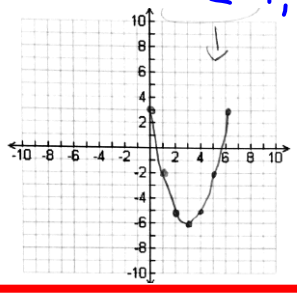
$y = a(x-h)^2 + k$

Apr 20-11:14 AM

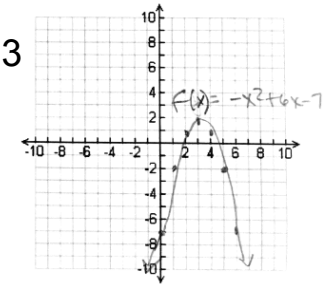
1) C
2) B
3) C
4) D
5) C
6) D
7) D
8) A
9) A
10) Minimum
y = 3
11) Maximum
y = 2

12) Maximum
y = 7
13) 144 ft
14) B
15)B
16) AOS x = 5
Vertex (5, -1)
17) $f(x) = (x + 3)^2 + 5$
18) $f(x) = -(x - 2)^2 - 7$

19) $f(x) = (x - 3)^2 + 5$
(3, 5)
20) $f(x) = (x - 4)^2 - 4$
(4, -4) AOS x = 4
$\{y \mid y \geq -4\}$ $[-4, \infty)$
21)



22) AOS x = 3
Vertex (3, 2)



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Transformations of a Quadratic Function

$x^2 + c$	*shift up c units*
$x^2 - c$	*shift down c units*
$(x + c)^2$	*shift left c units*
$(x - c)^2$	*shift right c units*
$-x^2$	*reflection over the x-axis*
cx^2	*when 0 < c < 1: vertical shrink (graph gets wider)* *when c > 1: vertical stretch (graph gets narrower)*

y-value changes

x-value changing

a = proper fraction

a = bigger than 1

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Transformations of a Quadratic Function

Compare the graph of each function with the graph of $f(x) = x^2$ parent function

a) $g(x) = 5x^2 + 10$

a = 5 stretch of 5

Up 10 units

b) $g(x) = -(x - 1)^2 + 2$

a: -1 reflection over the x-axis

Right one unit Up 2 units

c) $g(x) = \frac{1}{2}(x + 3)^2$

a: $\frac{1}{2}$ shrink by $\frac{1}{2}$

left 3 units

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Transformations of a Quadratic Function

Given $f(x) = x^2$, translate the function...

a. one unit to the left

$g(x) = (x+1)^2$

b. one unit to the right

$g(x) = (x-1)^2$

c. one unit upwards

$g(x) = x^2 + 1$

d. one unit downwards

$g(x) = x^2 - 1$

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Writing Quadratic Functions based on their Transformations

Write the equation of each transformation using the parent function $f(x) = x^2$

(d) Translation of 2 units down and a reflection over the x-axis

y-value

a = neg

$g(x) = -x^2 - 2$

(e) Vertical stretch of 5, translation of 5 units up and 3 units right

a = 5

x-values

y-value

$g(x) = 5(x-3)^2 + 5$

Apr 20-12:46 PM

Finding the Vertex of a Transformed Quadratic Function

(f) The vertex of the parabola $f(x) = x^2 - 4x + 5$ is (2, 1). Find the coordinates of the vertex of the function defined by

$g(x) = f(x + 4) - 2$.

Left 4 units Down 2 units

Original (2, 1)

New (-2, -1)

(g) The vertex of the parabola $h(x) = -x^2 + 2x - 3$ is (1, -2). Find the coordinates of the vertex of the function defined by

$g(x) = h(x - 2) + 3$

right 2 up 3

Original (1, -2) x^2, $+3$

New (3, 1)

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