Algebra 3-4
Unit 2 Day 10 **REVIEW** **NO GRAPHING CALC!**

Name: Key Per:______
Date:________________________

1. Write the equation of a square root function with a vertical compression of $\frac{1}{4}$, is shifted 4 units left, and is 3 units up.

$y = \frac{1}{4}\sqrt{x+4} + 3$

2. Write the equation of a cubic function that is reflected over the x-axis, has a vertical stretch of 3 and is shifted 7 units down.

$y = -3x^3 - 7$

3. For the following equations rewrite in the requested form. Then sketch a graph of each.

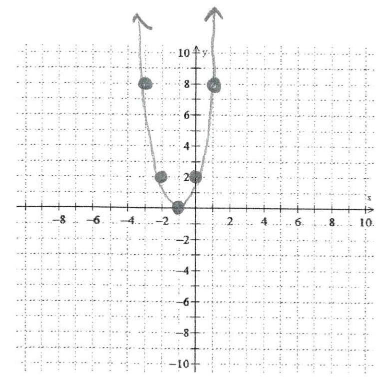
a) Write in standard form: $y = ax^2 + bx + c$
$y = 2(x+1)^2$

$y = 2(x+1)(x+1)$

	x	$+1$
x	x^2	x
$+1$	x	1

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

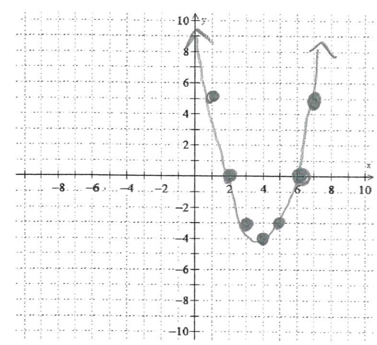
$\boxed{y = 2x^2 + 4x + 2}$



b) Write in vertex form: $y = a(x-h)^2 + k$
$y = x^2 - 8x + 12$

$y = x^2 - 8x + \underline{16} - \underline{16} + 12$

$\boxed{y = (x-4)^2 - 4}$



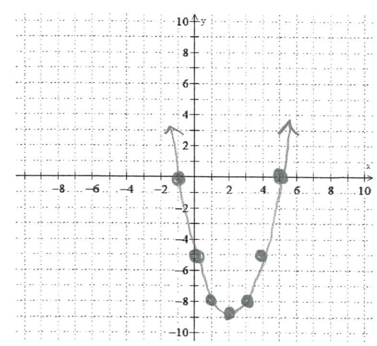
c) Write in vertex form: $y = a(x-h)^2 + k$
$y = (x-5)(x+1)$

$y = x^2 - 4x - 5$

	x	$+1$
x	x^2	x
-5	$-5x$	-5

$y = x^2 - 4x + \underline{4} - \underline{4} - 5$

$\boxed{y = (x-2)^2 - 9}$



d) Write in factored form: $y = a(x - r_1)(x - r_2)$
$y = -3(x+2)^2 + 3$

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

	x	$+2$
x	x^2	$2x$
$+2$	$2x$	4

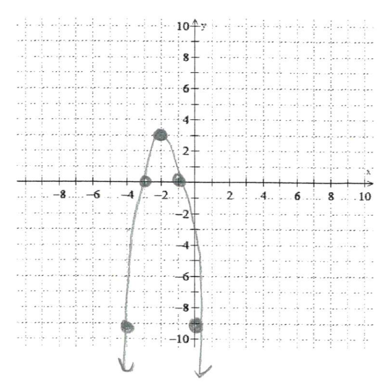
$y = -3(x^2 + 4x + 4) + 3$

$y = -3x^2 - 12x - 12 + 3$

$y = -3x^2 - 12x - 9$

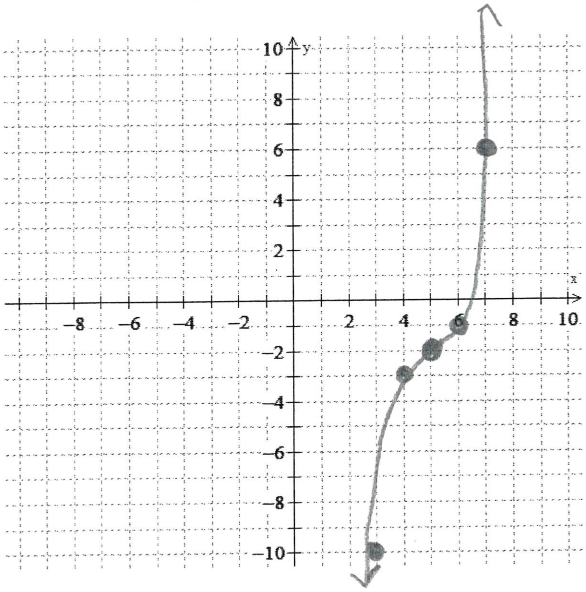
$y = -3(x^2 + 4x + 3)$

$\boxed{y = -3(x+1)(x+3)}$

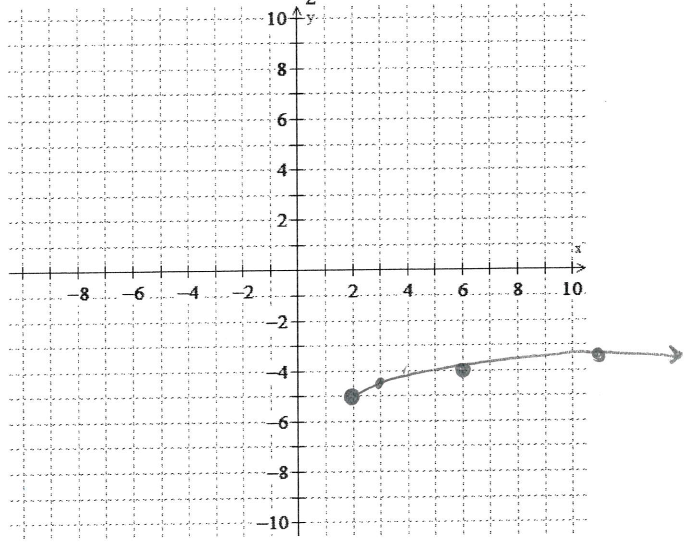


4. Graph each equation.

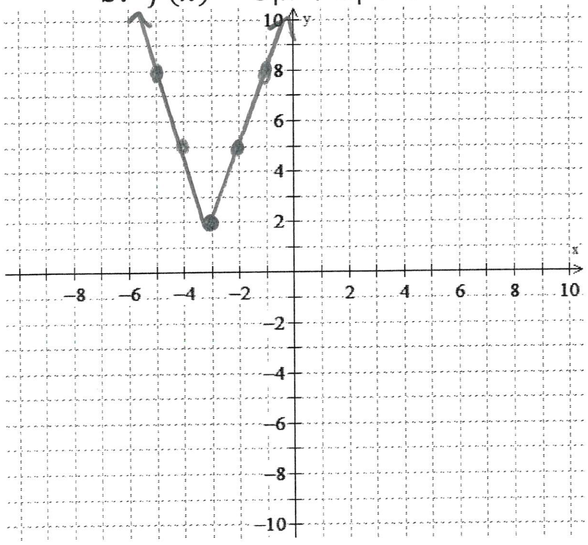
a. $f(x) = (x-5)^3 - 2$



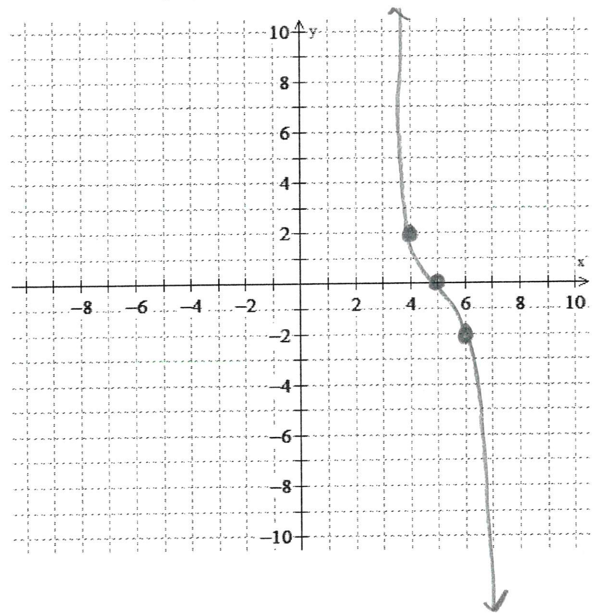
c. $f(x) = \frac{1}{2}\sqrt{x-2} - 5$



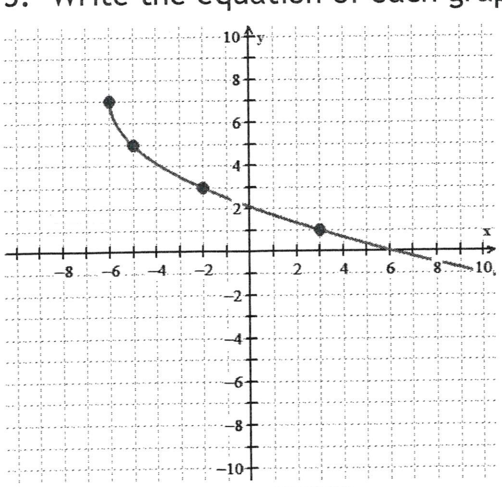
b. $f(x) = 3|x+3| + 2$



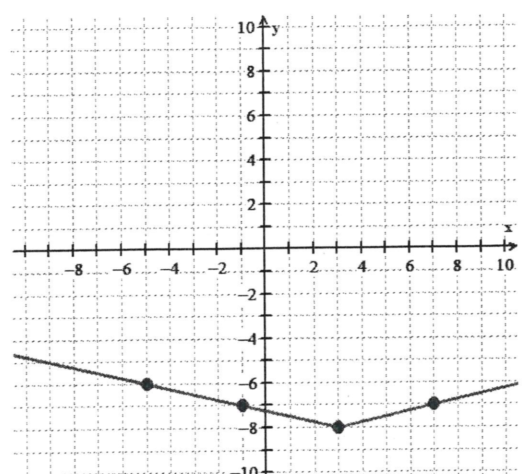
d. $f(x) = -2(x-5)^3$



5. Write the equation of each graph:

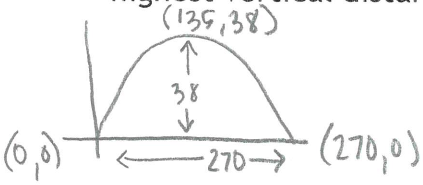


$y = -2\sqrt{x+6} + 7$



$y = \frac{1}{4}|x-3| - 8$

6. A golf ball is hit in a parabolic path. It travels a total horizontal distance of 270 feet. The highest vertical distance it reaches is 38 feet. Find an equation to model its path.



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

$y = a(x-135)^2 + 38$

$0 = a(0-135)^2 + 38$

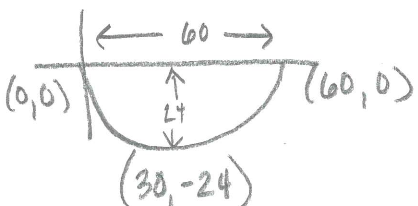
$-38 = a(-135)^2$

$-38 = a(18225)$

$\frac{-38}{18225} = a$

$\boxed{y = \frac{-38}{18225}(x-135)^2 + 38}$

7. A new ramp at the skate park has a parabolic shape. It starts at ground level and goes underground. It is 60 feet across and its deepest point is 24 feet below ground. Find an equation that models its shape.



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

$y = a(x-30)^2 - 24$

$0 = a(0-30)^2 - 24$

$24 = a(-30)^2$

$24 = a(900)$

$\frac{24}{900} = a$

$\boxed{y = \frac{24}{900}(x-30)^2 - 24}$

8. Find the exact equation of an absolute value function with a locator point at (1, 3) and passes through the point (7, 6).

h k

x y

$y = a|x-h| + k$

$6 = a|7-1| + 3$

$6 = a|6| + 3$

$3 = a|6|$

$3 = a(6)$

$\frac{3}{6} = a = \frac{1}{2}$

$\boxed{y = \frac{1}{2}|x-1| + 3}$

9. Find the exact equation of a cubic function with a locator point at (−2, −4) and passes through the point (−3, −7).

h k

x y

$y = a(x-h)^3 + k$

$-7 = a(-3+2)^3 - 4$

$-7 = a(-1)^3 - 4$

$-3 = a(-1)^3$

$-3 = a(-1)$

$\frac{-3}{-1} = a = 3$

$\boxed{y = 3(x+2)^3 - 4}$

(x, y)
(P, R)

10. The number of widgets the Woodget Company sells can be modelled by $R = -2.5p^2 + 500p$, where p is the price of a widget. What price will maximize the revenue? What is the maximum revenue?

↳ vertex

$R = -2.5(p^2 - 200p)$

$R = -2.5(p^2 - 200p + \underline{10000} - \underline{10000})$

$R = -2.5((p-100)^2 - 10000)$

$R = -2.5(p-100)^2 + 25{,}000$

P: max price: \$100
R: max revenue: \$25,000

11. The equation for the motion of a projectile fired straight up at an initial velocity of $64\ {}^{ft}/_{sec}$ is $h = 64t - 16t^2$, where h is the height in feet and t is the time in seconds. Find the time the projectile needs to reach its highest point. How high will it go?

↳ vertex

$h = -16t^2 + 64t$

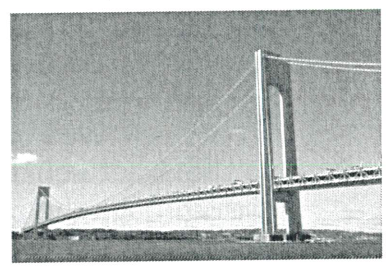
$h = -16(t^2 - 4t + \underline{4} - \underline{4})$

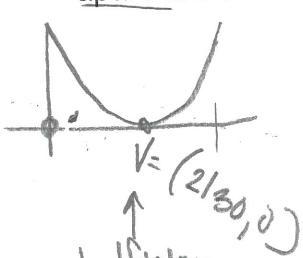
$h = -16((t-2)^2 - 4)$

$h = -16(t-2)^2 + 64$

time = 2 seconds
height = 64 feet

12. The photo shows the Verrazano-Narrows Bridge in New York, which has the longest span of any suspension bridge in the United States. A suspension cable of the bridge forms a curve that resembles a parabola. The curve can be modeled with the function $y = 0.0001432(x - 2130)^2$, where x and y are measured in feet. The origin of the function's graph is at the base of one of the two towers that support the cable. How far apart are the towers? How high are they?





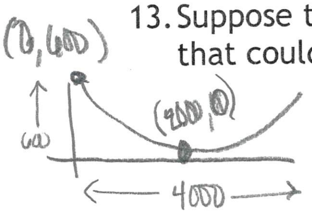
y int - make x = 0

$y = 0.0001432(0 - 2130)^2$

$y = 649.684$ feet tall

$(2130)(2) = 4260$ feet apart

13. Suppose the towers in problem #13 are 4000 feet apart and 600 feet high. Write a function that could model the curve of the suspension cable.



$600 = a(0 - 2000)^2$

$600 = a(4{,}000{,}000)$

$\frac{600}{4{,}000{,}000} = a = \frac{6}{40{,}000} = \frac{3}{20{,}000}$

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

$y = a(x - 2000)^2 + 0$

$y = \frac{3}{20{,}000}(x - 2000)^2$