Algebra 3-4
1st Semester Review Unit 1 HW

Name: _____ Per: _____
Date: _____

1. Solve algebraically. Check your solutions.

a) $-3|x+1|+4 \geq -12$

$-4 \quad -4$

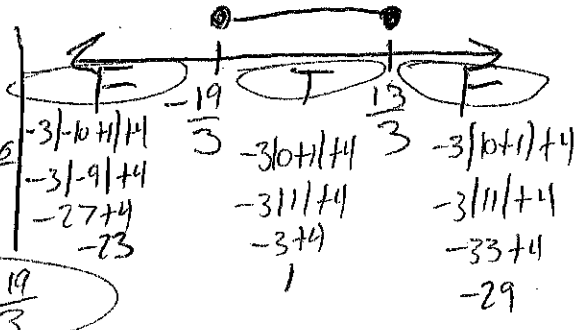
$\frac{-3|x+1|}{-3} = \frac{-16}{-3}$

$|x+1| = \frac{16}{3}$

$x+1 = \frac{16}{3}$ or $x+1 = -\frac{16}{3}$

$-1 \quad -1$ $\quad -1 \quad -1$

$x = \frac{13}{3}$ $\quad x = -\frac{19}{3}$



b) $\sqrt{x+3}+4 > 8$

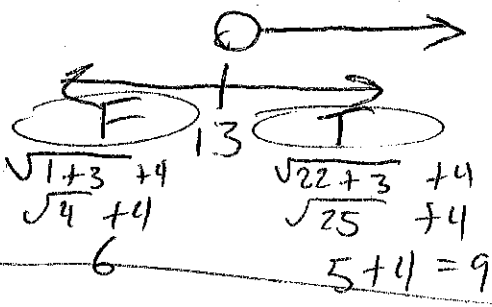
$-4 \quad -4$

$(\sqrt{x+3})^2 = (4)^2$

$x+3 = 16$

$-3 \quad -3$

$x = 13$



c) $\frac{3\sqrt{4x+3}}{3} = \frac{63}{3}$

$(\sqrt{4x+3})^2 = (21)^2$

$4x+3 = 441$

$-3 \quad -3$

$\frac{4x}{4} = \frac{438}{4}$

$x = 109.5$

d) $7x^{\frac{1}{6}} = 42$

$\frac{7}{} \quad \frac{7}{}$

$(x^{1/6})^6 = (6)^6$

$x = 46656$

e) $-2(x+3)^2+1 = -49$

$-1 \quad -1$

$\frac{-2(x+3)^2}{-2} = \frac{-50}{-2}$

$(x+3)^2 = 25$

$x+3 = 5$ or $x+3 = -5$

$-3 \quad -3$ $\quad -3 \quad -3$

$x = 2$ $\quad x = -8$

f) $-|2x-4|+1 = 21$

$-1 \quad -1$

$\frac{-|2x+4|}{-1} = \frac{20}{-1}$

$|2x+4| = -20$

No solution b/c distance is/is't negative.

2. **Solve the system of equations:**

$\begin{cases} y = -3x + 8 \\ y = 3x - 2 \end{cases}$

$-3x+8 = 3x-2$
$+3x \quad +3x \quad +2$

$\frac{10}{6} = \frac{6x}{6}$

$5/3 = x$

$y = 3(5/3) - 2$

$= 5 - 2 = 3 = y$

$\begin{cases} -16y = 24 + 8x \\ -12y - 4x = 16 \end{cases}$

$\frac{-16y}{-16} = \frac{24+8x}{-16}$

$y = \frac{24+8x}{-16}$

$-16\left[-12\left(\frac{24+8x}{-16}\right) - 4x = 16\right]-16$

$-12(24+8x) + 64x = -256$

$-288 - 96x + 64x = -256$
$+288 \qquad +288$

$\frac{-32x}{-32} = \frac{32}{-32}$

$x = -1$

$y = \frac{24+8(-1)}{-16} = -1$

$y = -1$

$\begin{cases} 3x - y = 3 \\ 7x - y = -5 \end{cases}$ (subtract)

$-4x = 8$

$\frac{-4x}{-4} = \frac{8}{-4}$

$x = -2$

$3(-2) - y = 3$

$-6 - y = 3$
$+6 \qquad +6$

$\frac{-y}{-1} = \frac{9}{-1}$

$y = -9$

$\begin{cases} y = x^2 - 7x + 14 \\ y = x - 1 \end{cases}$

$x^2 - 7x + 14 = x - 1$
$-x \quad +1 \quad -x \quad +1$

$x^2 - 8x + 15 = 0$

$(x-3)(x-5) = 0$

$x = 3 \qquad x = 5$

$y = 2 \qquad y = 4$

3. The school that Lisa goes to is selling tickets to the annual talent show. On the first day of ticket sales the school sold 4 senior citizen tickets and 5 student tickets for a total of \$102. The school took in \$126 on the second day by selling 7 senior citizen tickets and 5 student tickets. How much does the school make if they sell 6 senior citizen tickets and 6 student tickets?

$4x + 5y = 102$
$-(7x + 5y = 126)$

$-3x = -24$

$\frac{-3x}{-3} = \frac{-24}{-3}$

$x = 8$

$4(8) + 5y = 102$

$32 + 5y = 102$
$-32 \qquad -32$

$\frac{5y}{5} = \frac{70}{5}$

$y = 14$

$6(8) + 6(14)$

$48 + 84$

\$132

4. Seven smoothies and twelve cookies cost a total of \$54.65. Twelve smoothies cost \$13.35 less than 27 cookies. Find the cost of a smoothie and the cost of a cookie.

$7s + 12c = 54.65$

$\frac{12s}{12} = \frac{27c - 13.35}{12}$

$s = \frac{27c - 13.35}{12}$

$12 \cdot \left[7\left(\frac{27c - 13.35}{12}\right) + 12c = 54.65\right] \cdot 12$

$7(27c - 13.35) + 144c = 655.8$

$189c - 93.45 + 144c = 655.8$

$333c - 93.45 = 655.8$

$333c = 749.25$

$c = 2.25$

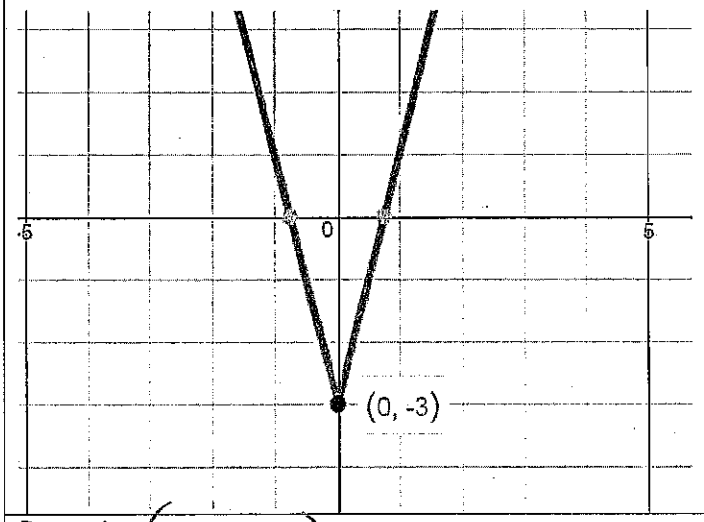
$s = \frac{27(2.25) - 13.35}{12}$

$s = 3.95$

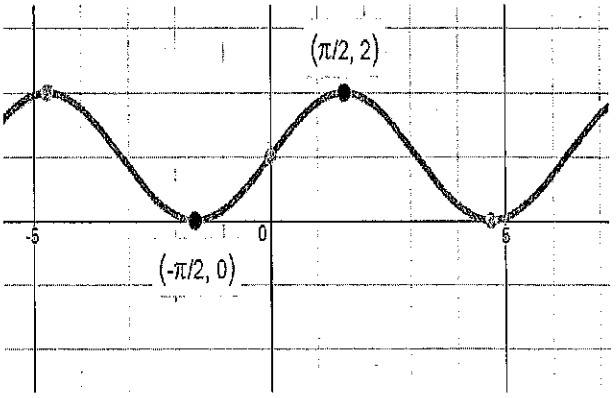
Algebra 3-4
1st Semester Review Unit 2 HW

Name: _____ Per: _____
Date: _____

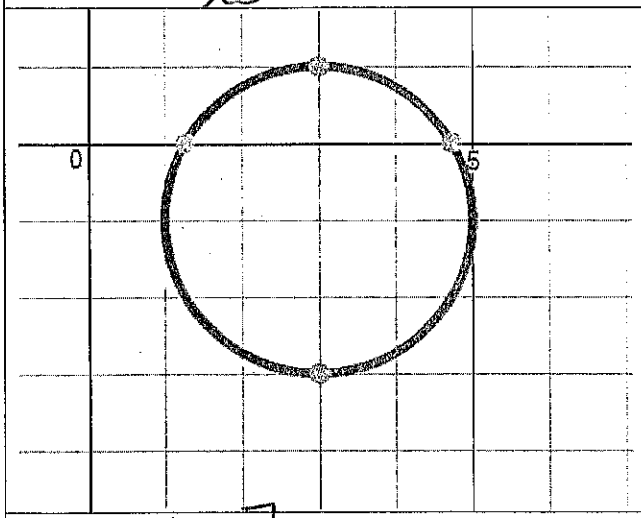
1. **For each graph give the domain, range, and decide if it is a function.**



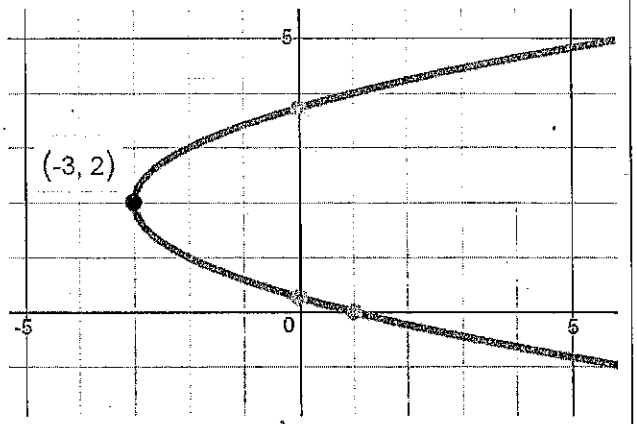
Domain: $(-\infty, \infty)$
Range: $[-3, \infty)$
Function? yes



Domain: $(-\infty, \infty)$
Range: $(0, 2)$
Function? yes

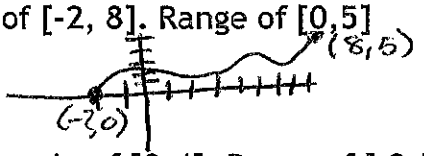


Domain: $[1, 5]$
Range: $[-3, 1]$
Function? No

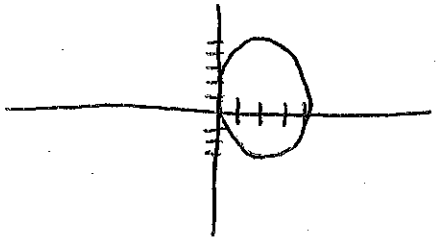


Domain: $[-3, \infty)$
Range: $(-\infty, \infty)$
Function? No

2. **Draw a graph of a relation that matches the description:**
   a. **Function. Domain of [-2, 8]. Range of [0,5]**



   b. **Not a Function. Domain of [0,4]. Range of [-3,5]**



3. Evaluate the following expressions given the functions below:

$g(x) = -3(x+1)$ $\quad f(x) = (x+2)^2 + 7$ $\quad h(x) = \dfrac{12}{x+3}$ $\quad j(x) = 2(x+9)$

$g(10) = -3(10+1)$
-33

$h(-2) = \dfrac{12}{-2+3} = \dfrac{12}{1} = 12$

Find $h(x) = -2$

$\dfrac{12}{x+3} = -2$ $\quad x+3$

$12 = -2(x+3)$

$\dfrac{12}{-2} = \dfrac{-2(x+3)}{-2}$

$-6 = x+3$

$-9 = x$

$f(3) = (3+2)^2 + 7$
$5^2 + 7$
$25+7 = 32$

Find $f(x) = 23$

$(x+2)^2 + 7 = 23$
$-7 \quad -7$
$\sqrt{(x+2)^2} = \sqrt{16}$
$x+2 = 4 \quad x+2 = -4$
$x = 2 \quad x = -6$

Find $f(h(x))$

$(h(x)+2)^2 + 7$

$\left(\dfrac{12}{x+3} + 2\right)^2 + 7$

Find $g(x) = 16$

$\dfrac{-3(x+1)}{-3} = \dfrac{16}{-3}$

$x+1 = \dfrac{16}{-3}$

$x = -\dfrac{19}{3}$

$j(7) =$

$2(7+9)$
$2(16) = 32$

4. Given the graph of the function, find:

$f(-5) = 0$

$f(0) = 0$

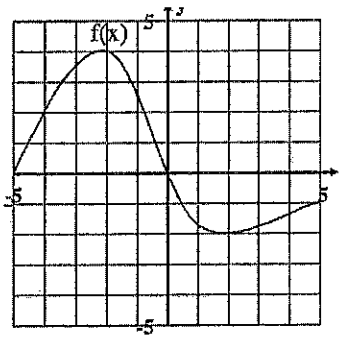
$f(2) = -2$

x when $f(x) = 3$

$x = -1.2, x = -3.5$

x when $f(x) = 0$

$x = -5, x = 0$



5. Find the inverses of each.

a) $g(x) = (x-1)^3 + 2$

$y = (x-1)^3 + 2$
$-2 \quad -2$
$\sqrt[3]{y-2} = \sqrt[3]{(x-1)^3}$
$\sqrt[3]{y-2} = x-1$
$+1 \quad +1$
$\sqrt[3]{y-2} + 1 = x$

b) $f(x) = \sqrt{3x-7} + 2$

$y = \sqrt{3x-7} + 2$
$-2 \quad -2$
$(y-2)^2 = (\sqrt{3x-7})^2$
$(y-2)^2 = 3x - 7$
$+7 \quad +7$
$(y-2)^2 + 7 = 3x$
$\dfrac{(y-2)^2+7}{3} = \dfrac{3x}{3}$
$\dfrac{(y-2)^2+7}{3} = x$

6. Verify the following are inverses. Show all work.

a) $g(x) = -10x + 5$
$f(x) = \dfrac{x-5}{10}$

Plug in $x = 0$.
$g(0) = -10(0) + 5$
$g(0) = 5$
Plug in $x = 5$
$f(5) = \dfrac{5-5}{10} = \dfrac{0}{10} = 0$
We got back $x = 0$, so yes, they are inverses.

b) $f(n) = -(n+1)^3$
$g(n) = 3 + n^3$

$f(0) = -(0+1)^3$
$f(0) = -1$
$g(-1) = 3 + (-1)^3$
$g(-1) = 3 - 1 = 2$
No. Not inverse.

Algebra 3-4
1st Semester Review Unit 3 HW

Name: _____ Per: _____
Date: _____

1. Write an exponential equation that goes through the points (4, 31.1) and (10, 92.88).

$m = \sqrt[6]{\frac{92.88}{31.1}} = 1.2$

$y = b(1.2)^x$

$\frac{31.1}{1.2^4} = \frac{b(1.2)^4}{1.2^4}$

$15 = b$

$y = 15(1.2)^x$

2. Write an exponential equation to model the population 'x' years after year zero.

x: # years after year zero	0	1	2	3	4	5
y: population	10000	12350	15,252	18837	23263	28,730

$m = \sqrt[3]{\frac{28730}{15252}} = 1.235$

$y = b(1.235)^x$

$\frac{15252}{1.235^2} = \frac{b(1.235)^2}{1.235^2}$

$b = 9999.83 \approx 10000$

$y = 10000(1.235)^x$

3. Solve.

a) $1.235^x = 18$

$x = \sqrt[x]{18}$ or $x = 18^{1/x}$

$x = 1.78$

b) $3^{2x-3} = 30$

$\log_3 \quad \log_3$

$2x - 3 = \log_3 30$

$2x - 3 = \frac{\log(30)}{\log(3)}$

$2x - 3 = 3.1$

$+3 \quad +3$

$\frac{2x}{2} = \frac{6.1}{2}$

$x = 3.05$

c) $\log_5 8 = 3x + 4$

$\frac{\log(8)}{\log(5)} = 3x + 4$

$1.29 = 3x + 4$

$-4 \quad -4$

$\frac{-2.71}{3} = \frac{3x}{3}$

$-.9 = x$

d) $2(5)^{x-5} - 3 = 55$

$+3 \quad +3$

$\frac{8(5)^{x-5}}{2} = \frac{58}{2}$

$\log_5 5^{x-5} = \log_5 29$

$x - 5 = \log_5 29$

$x - 5 = \frac{\log(29)}{\log(5)}$

$x - 5 = 2.09$

$+5 \quad +5$

$x = 7.09$

e) $\log_7(4) = x$

$\frac{\log 4}{\log 7} = x$

$.71 = x$

f) $\log_5(\sqrt{2x+1}) = 2$

$5 \quad 5$

$\sqrt{2x+1} = 5^2$

$(\sqrt{2x+1})^2 = (25)^2$

$2x + 1 = 625$

$-1 \quad -1$

$2x = 624$

$x = 312$

4. The average cost of a movie ticket is $9.50. The price increases 2.5% per year.

a. Write an exponential equation to model this situation. Define your variables.

$y = 9.50(1.025)^x$ x = # of years, y = price of ticket.

b. What will be the cost of a movie ticket in 5 years?

$y = 9.50(1.025)^5$

$y = 10.75$

c. Assuming the price continues to grow at this rate, how long will it take until the price of a ticket doubles? Show ALL work.

$\frac{19}{9.5} = \frac{9.50(1.025)^x}{9.5}$

$2 = (1.025)^x$

$\log_{1.025} 2 = \log_{1.025} (1.025)^x$

$\log_{1.025} 2 = x$

$\frac{\log(2)}{\log(1.025)} = x$

$28.07 = x$

d. To stay in business movie theaters need the price of tickets to increase to $25 within the next 10 years. What percent growth would be required for movie theaters to meet this goal? Show ALL work.

$\frac{25}{9.5} = \frac{9.50(1+r)^{10}}{9.5}$

$\sqrt[10]{2.63} = \sqrt[10]{(1+r)^{10}}$

$1.10 = 1 + r$

$-1 \quad -1$

$.10 = r$

$r = 10\%$

5. Find the inverse of $f(x) = \log_2(x - 1) + 2$.

Check your inverse by finding some points on f(x) and $f^{-1}(x)$.

$y = \log_2(x-1) + 2$

$-2 \quad -2$

$2^{y-2} = \log_2(x-1)$

$2^{y-2} = (x-1)$

$+1 \quad +1$

$2^{y-2} + 1 = x$

$f(3) = \log_2(3-1) + 2$

$= \log_2(2) + 2 = 1 + 2 = 3$

$f(3) = 3$

$2^{3-2} + 1 = 2^1 + 1 = 3$

:)

Algebra 3-4
1st Semester Review Unit 4 HW

Name: _____ Per: _____
Date: _____

***** NO CALCULATOR *** NO CALCULATOR *** NO CALCULATOR *****

1. Describe what transformations a, h, and k perform. $y = a(x - h) + k$

vertical stretch Horizontal shift vertical shift.

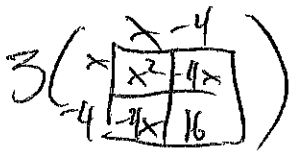
2. Write the equation of an absolute value function with a vertical stretch of 2, is shifted 3 units right, and is 4 units down.

$y = 2|x - 3| - 4$

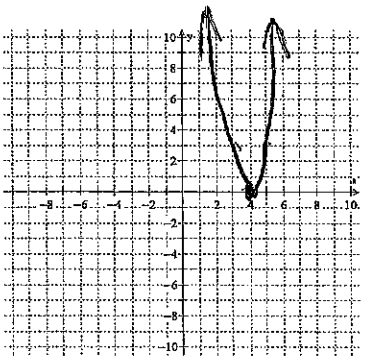
3. Write the equation of a square root function that is reflected over the x-axis, has a vertical compression of $\frac{1}{3}$ and is shifted 7 units up.

$y = -\frac{1}{3}\sqrt{x} + 7$

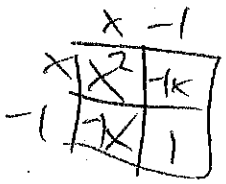
4. For the following equations rewrite in the requested form(s). Then sketch a graph of each.
   a) Write in standard form:
   $y = 3(x - 4)^2$



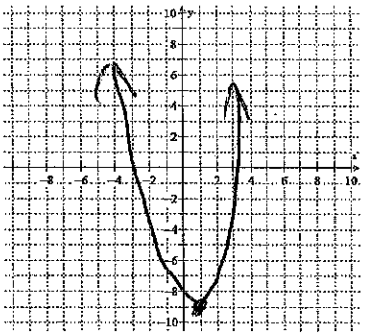
$3(x^2 - 8x + 16) = 3x^2 - 24x + 48$



   b) Write in vertex form:
   $y = x^2 - 2x - 8$

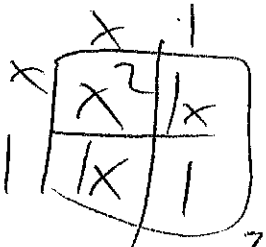


$(x - 1)^2 - 9$

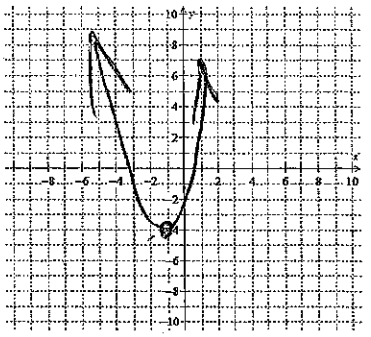


   c) Write in vertex form: (hint: write in standard form first!)
   $y = (x + 3)(x - 1)$

$= x^2 + 2x - 3$

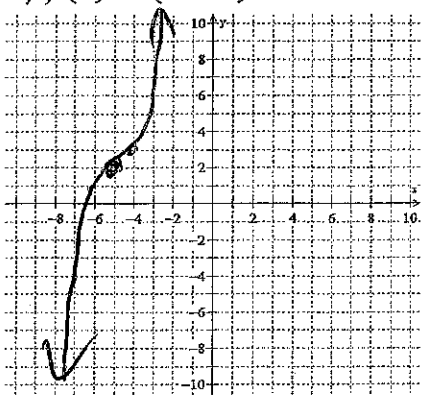


$(x + 1)^2 - 4$

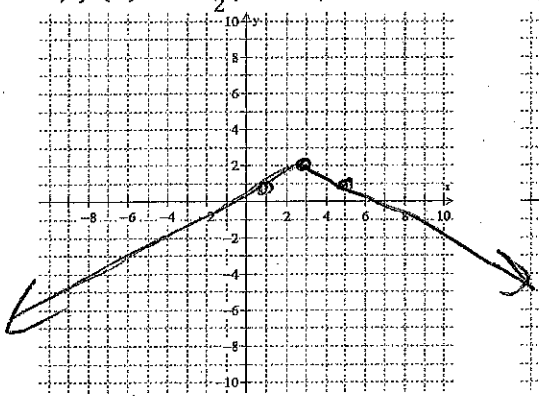


5. Graph each equation **without a calculator**.

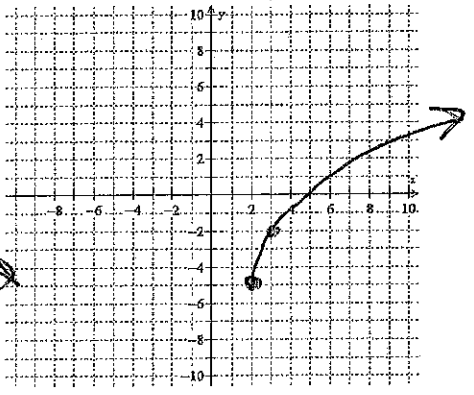
a) $f(x) = (x+5)^3 + 2$



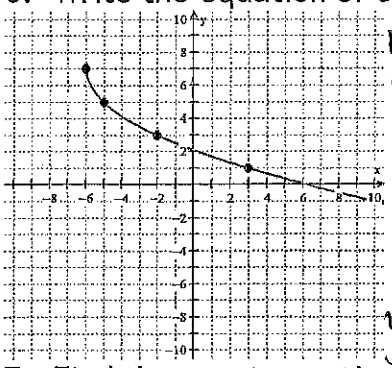
b) $f(x) = -\frac{1}{2}|x-3| + 2$



c) $f(x) = 3\sqrt{x-2} - 5$



6. Write the equation of each graph:



$y = a\sqrt{x+6} + 7$

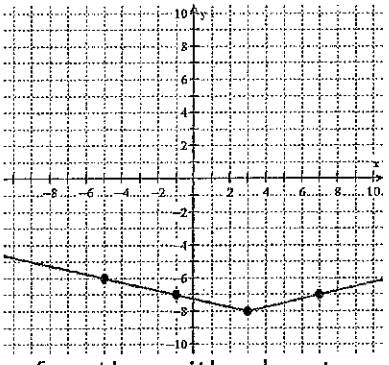
$5 = a\sqrt{-5+6} + 7$

$5 = a\sqrt{1} + 7$

$-7 \quad -7$

$-2 = a$

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



$y = a|x-3| - 8$

$-7 = a|-1-3| - 8$

$+8 \qquad +8$

$\frac{1}{4} = \frac{a|-4|}{4}$

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

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

$y = a|x-1| + 3$

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

$6 = a|6| + 3$

$-3 \quad -3$

$\frac{3}{6} = \frac{a|6|}{6}$

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

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

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

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

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

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

$+4 \quad +4$

$-3 = a(-1)$

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

$3 = a$

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

9. Factor.

a) $b^2 - 6b + 8$

	b	-4
b	b^2	$-4b$
-2	$-2b$	8

$(b-4)(b-2)$

b) $\frac{2n^2 + 6n - 108}{2}$

$2(n^2 + 3n - 54)$

	n	$+9$
n	n^2	$9n$
-6	$-6n$	-54

$2(n+9)(n-6)$

c) $6x^2 + 5x - 6$

	$3x$	-2
$2x$	$6x^2$	$-4x$
3	$9x$	-6

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

d) $4x^2 - 4x + 1$

	$2x$	-1
$2x$	$4x^2$	$-2x$
$-($	$-2x$	1