

This review is not intended to be an all-in-one study guide for the final exam.
In addition to completing this review, you should look through your old tests, quizzes, reviews, notes, homework, etc.

1. Evaluate each expression if $a = 2$, $b = -2$, and $c = 5$.

a. $b^2 - 4ac$
 $(-2)^2 - 4(2)(5)$
 $4 - 40$
 -36

b. $3(2a - 3c) + b^3$
 $3(2(2) - 3(5)) + (-2)^3$
 $3(4 - 15) + (-8)$
 $3(-11) - 8$
 $-33 - 8 = -41$

c. $(b+c) - (100+c) + 6(b+a)^2$
 $(-2) + (5) - (100 + (5)) + 6((-2) + (2))^2$
 $3 - 105 + 6(0)^2$
 $3 - 105 + 6(0)$
 $3 - 105 + 0$
 -102

2. Solve each equation for x .

a. $-4(2x+5) - 3 = -8x+5$
 $-8x - 20 - 3 = -8x + 5$
 $-8x - 23 = -8x + 5$
 $+8x \quad +8x$
 $-23 \neq 5$
No Solution

b. $\frac{1}{2}(x-6) + 4 = 3$
 $\frac{1}{2}x - 3 + 4 = 3$
 $\frac{1}{2}x + 1 = 3$
 $-1 \quad -1$

c. $\frac{x+30}{5} - 3 = 17$
 $+3 \quad +3$

d. $3x + 2x - 18 = 5(x+5) - 7$
 $5x - 18 = 5x + 25 - 7$
 $5x - 18 = 5x + 18$
 $-5x \quad -5x$
 $-18 \neq 18$
No Solution

e. $\frac{x+30}{5} = 20 \cdot 5$
 $x + 30 = 100$
 $-30 \quad -30$
 $x = 70$

f. $ax - bx + 5 = 10$
 $-5 \quad -5$
 $ax - bx = 5$
 $x(a-b) = 5$
 $\frac{x(a-b)}{a-b} = \frac{5}{a-b}$
 $x = \frac{5}{a-b}$

g. $2|x-1| + 4 = 16$
 $-4 \quad -4$
 $\frac{2|x-1|}{2} = \frac{12}{2}$
 $|x-1| = 6$

$x-1 = 6 \quad x-1 = -6$
 $+1 \quad +1 \quad +1 \quad +1$
 $x = 7 \quad x = -5$

h. $x^2 - 22x + 121 = 0$
 $(x-11)(x-11) = 0$
 $x-11 = 0 \quad x-11 = 0$
 $+11 \quad +11 \quad +11 \quad +11$
 $x = 11 \quad x = 11$

~~$x+2 = -4$~~
 ~~$3 = x-5$~~

$(x+2)(x-5) = -12$
 $x^2 - 5x + 2x - 10 = -12$
 $+12 \quad +12$
 $x^2 - 3x + 2 = 0$
 $(x-2)(x-1) = 0$

$x-2 = 0 \quad x-1 = 0$
 $+2 \quad +2 \quad +1 \quad +1$
 $x = 2 \quad x = 1$

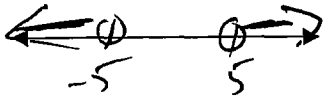
i. $5x^2 - 44 = 1$
 $+44 \quad +44$
 $\frac{5x^2}{5} = \frac{45}{5}$
 $x^2 = 9$
 $x = \pm 3$

j. $8x^2 - 2x - 3 = 0$
 $(4x-3)(2x+1) = 0$
 $4x-3 = 0 \quad 2x+1 = 0$
 $+3 \quad +3 \quad -1 \quad -1$
 $\frac{4x}{4} = \frac{3}{4} \quad \frac{2x}{2} = \frac{-1}{2}$
 $x = \frac{3}{4} \quad x = -\frac{1}{2}$

3. Solve each inequality and graph the solution on the number line provided.

a. $x^2 - 25 > 0$

$(x-5)(x+5) > 0$

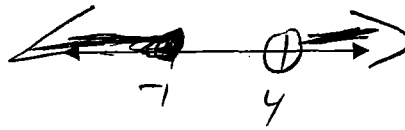


b. $\frac{1}{2}x + 2 > 4$ or $-3(x-2) \geq 9$

$\frac{1}{2}x > 2$
 $x > 4$

$-3x + 6 \geq 9$
 $-6 \geq 3$

$-3x \geq 3$
 $x \leq -1$



c. $|2x+1| - 3 < 12$
 $|2x+1| < 15$

$2x+1 > -15$
 $2x > -16$
 $x > -8$

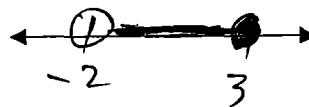
$2x+1 < 15$
 $2x < 14$
 $x < 7$



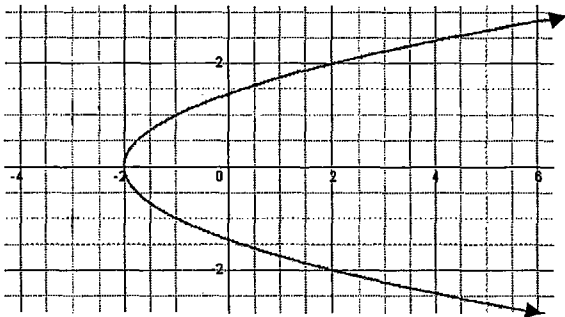
d. $4(x-1) + 4 \leq 12$ and $5x+1 > -9$

$4x - 4 + 4 \leq 12$
 $4x \leq 12$
 $x \leq 3$

$5x + 1 > -9$
 $5x > -10$
 $x > -2$



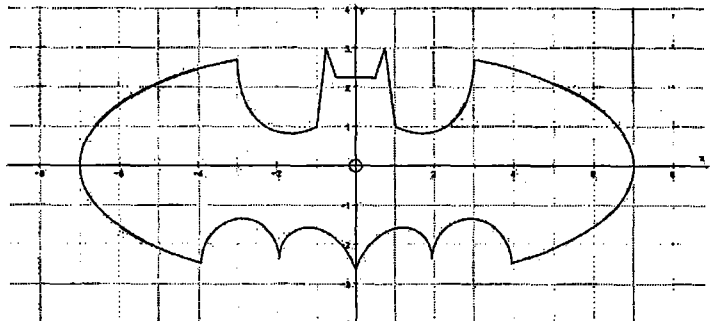
4. Describe the domain and range of each function. Then decide if it's a function.



Domain: $[-2, \infty)$

Range: $(-\infty, \infty)$

Is it a function?: no



Domain: $[-7, 7]$

Range: $[-3, 3]$

Is it a function?: no

5. Write a quadratic function using the vertex form that does the following:

a. Vertex moves left 3, up 5 and reflects over the x-axis.

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

b. Stretches by a factor of 1/2 and shifts up 1.

$f(x) = \frac{1}{2}x^2 + 1$

6. Write an absolute value function that does the following:

a. Shifts right 6 and reflects over the x-axis.

$$f(x) = -|x-6|$$

b. Shifts up 2 and left 1.

$$f(x) = |x+1| + 2$$

7. Write an equation of a line in slope-intercept form that passes through the points (1,8) and (3,-2).

$$m = \frac{-2-8}{3-1} = \frac{-10}{2} = -5$$

$$\begin{aligned} 8 &= -5(1) + b \\ 8 &= -5 + b \\ +5 & \quad +5 \\ 13 &= b \end{aligned}$$

$$y = -5x + 13$$

8. Write an equation of a line that is parallel to the above line and goes through the point (4, 9).

$$m = -5$$

$$\begin{aligned} y &= -5x + b \\ 9 &= -5(4) + b \end{aligned}$$

$$\begin{aligned} 9 &= -20 + b \\ +20 & \quad +20 \\ 29 &= b \end{aligned}$$

$$y = -5x + 29$$

9. Find the x and y intercept(s) of each equation.

X-INT a. $2x + 3y = 18$

$$\begin{aligned} 2x + 3(0) &= 18 \\ 2x &= 18 \\ \frac{2x}{2} &= \frac{18}{2} \\ x &= 9 \\ (9, 0) \end{aligned}$$

Y-INT b. $y = 3x - 9$

$$\begin{aligned} 2(0) + 3y &= 18 \\ 3y &= 18 \\ \frac{3y}{3} &= \frac{18}{3} \\ y &= 6 \\ (0, 6) \end{aligned}$$

$$\begin{aligned} 0 &= 3x - 9 \\ +9 & \quad +9 \\ 9 &= 3x \\ \frac{9}{3} &= \frac{3x}{3} \\ 3 &= x \\ (3, 0) \end{aligned}$$

c. $y = 2x^2 - 9x - 5$

$$(-1, 0) \quad (5, 0)$$

$$\begin{aligned} 0 &= 2x^2 - 9x - 5 \\ 0 &= (2x + 1)(x - 5) \\ 2x + 1 &= 0 & x - 5 &= 0 \\ -1 &= -1 & +5 &= +5 \\ 2x &= -1 & x &= 5 \\ x &= -\frac{1}{2} & x &= 5 \end{aligned}$$

$$y = -5$$

$$(0, -5)$$

10. In 2002, there were 1221 students at seaholm. In 2009, that number rose to 1408 students. What is the rate of change in the number of students?

$$\frac{1408 - 1221}{2009 - 2002} = \frac{187}{7} = 26.71 \approx 27 \text{ STUDENTS PER YEAR}$$

11. Write an equation of a vertical line and horizontal line that goes through the point (-2, 5). Label which is which.

VERTICAL

$$x = -2$$

HORIZONTAL

$$y = 5$$

12. If an infant weighed 6 lbs at birth and 1 year later it weighs 32 pounds, write a linear equation to model this situation, then find how long it would take before the child weighs 90 pounds.

1 YEAR = 12 MONTHS

$$\frac{32 - 6}{12 - 0} = \frac{26}{12} = \frac{13}{6}$$

$$y = \frac{13}{6}x + 6$$

$$\begin{aligned} 90 &= \frac{13}{6}x + 6 \\ -6 & \quad -6 \\ 84 &= \frac{13}{6}x \\ \left(\frac{6}{13}\right)84 &= \frac{13}{6}x \left(\frac{6}{13}\right) \end{aligned}$$

$$x = 38.77 \approx 39 \text{ MONTHS}$$

$$\begin{aligned} y &= 26x + 6 \\ 90 &= 26x + 6 \\ -6 & \quad -6 \\ 84 &= 26x \\ \frac{84}{26} &= \frac{26x}{26} \end{aligned}$$

$$x \approx 3.23 \text{ YEARS}$$

13. Tell if the statement is true or false and explain why.

a. The vertex is (0,-8). FALSE

MINIMUM IS AT (1, -9)

b. (x+2) and (x-4) are factors of the quadratic.

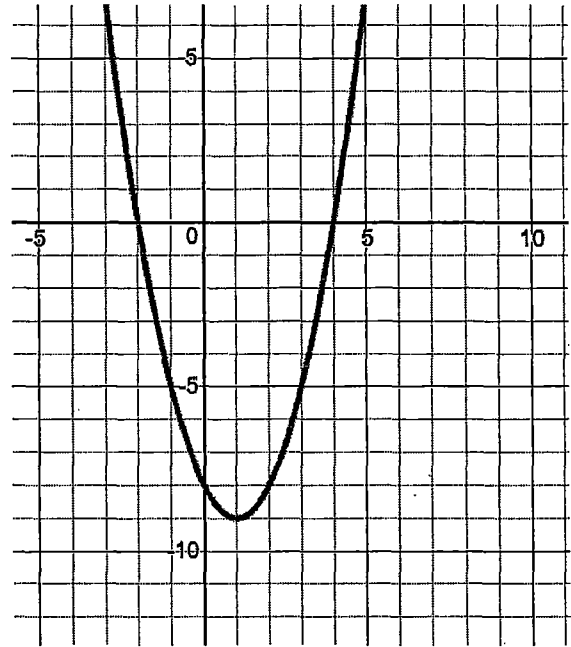
TRUE
X-INTERCEPTS ARE -2, -4

c. The a-value of the quadratic would be negative.

FALSE PARABOLA OPENS UP

d. This graph would have a positive discriminant.

TRUE 2 X-INTERCEPTS
(2 REAL SOLUTIONS)



14. Using the graph of #13, which value(s) does the graph increase and decrease from?

Increase $(1, \infty)$ Decrease $(-\infty, 1)$

15. Last year, the Seaholm marching band sold candy to earn money for a trip to Orlando, Florida. The chocolate candy sold for \$3.00 per bar and the sour candy sold for \$2.00 per package. Cole Slaw, a member of the marching band, sold 30 total items of candy and collected \$70. If, 10 chocolate bars were sold, how many sour bags of candy were sold?

$$70 = 3c + 2s$$

$$70 = 3(10) + 2s$$

$$70 = 30 + 2s$$

$$\begin{array}{r} -30 \\ 70 - 30 \\ \hline 40 = 2s \\ \frac{40}{2} = \frac{2s}{2} \\ 20 = s \end{array}$$

$$30 - 10 = 20$$

$$20 = s$$

16. Throughout the night my roof started leaking and water was dripping on my floor. I placed a bucket under it to catch the water, but was afraid it might overflow. After 2 hours there was 18 oz. of water in it. After 6 hours, there was 30 oz. of water.

a. Using what we know, write a linear equation to model the situation.

$$m = \frac{30 - 18}{6 - 2} = \frac{12}{4} = 3$$

$$y = 3x + b$$

$$18 = 3(2) + b$$

$$18 = 6 + b$$

$$\begin{array}{r} 18 - 6 = 6 + b - 6 \\ \hline 12 = b \end{array}$$

$$(2, 18) \quad (6, 30)$$

$$y = 3x + 12$$

b. What does the slope represent in context?

HOW FAST WATER IS DRIPPING INTO THE BUCKET

c. What does the y-intercept represent in context?

HOW MUCH WATER WAS IN THE BUCKET TO BEGIN WITH

d. How long until my 60 oz. bucket overflows?

$$60 = 3x + 12$$

$$\begin{array}{r} 60 - 12 \\ \hline 48 = 3x \\ \frac{48}{3} = \frac{3x}{3} \end{array}$$

$$x = 16 \text{ Hours}$$

$$(2x+1)(x-5)$$

17. Graph the following: $y = 2x^2 - 9x - 5$ (same problem from 9c)

$$x = \frac{9}{2(2)} = \frac{9}{4} = 2.25 \quad 2\left(\frac{9}{4}\right)^2 - 9\left(\frac{9}{4}\right) - 5$$

AOS: $x = 2.25 = \frac{9}{4}$

$$\frac{81}{8} - \frac{81}{4} - 5$$

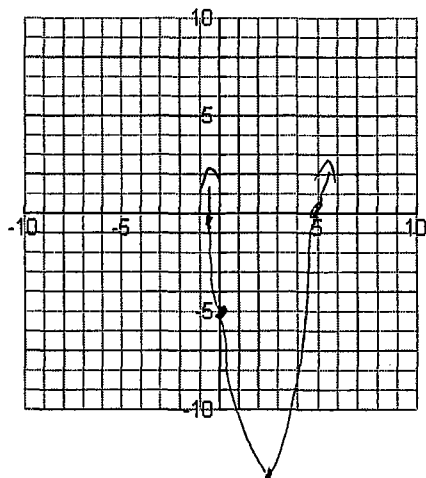
Vertex: $(2.25, -15.125)$

$$\frac{81}{8} - \frac{162}{8} - \frac{40}{8}$$

Y-intercept: $(0, -5)$

$$-\frac{121}{8} = -15.125$$

X-intercept: $(-\frac{1}{2}, 0)$ $(5, 0)$



$$(2.25, -15.125)$$

18. Graph the following inequalities and shade the solutions.

a. $y > 2x - 3$

b. $y \geq .5|x+3|$

c. $y > x^2 + 4x + 3$

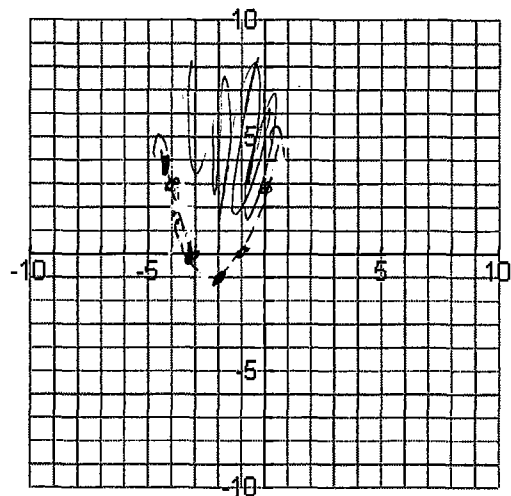
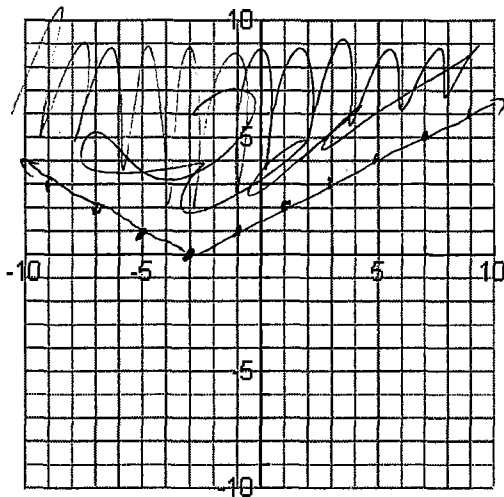
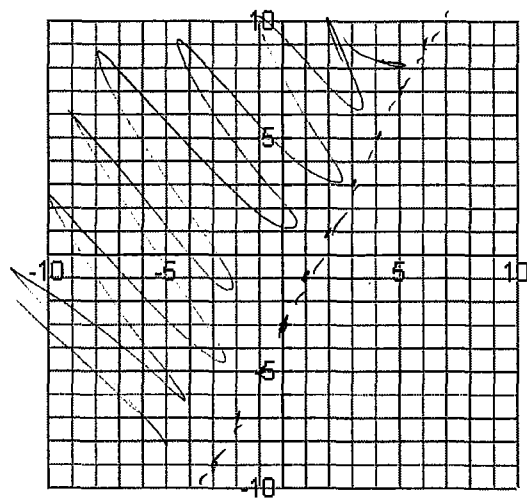
$$(x+3)(x+1)$$

$$\frac{-4}{2(1)} = \frac{-4}{2} = -2$$

$$(-2, -1)$$

$$(-2)^2 + 4(-2) + 3$$

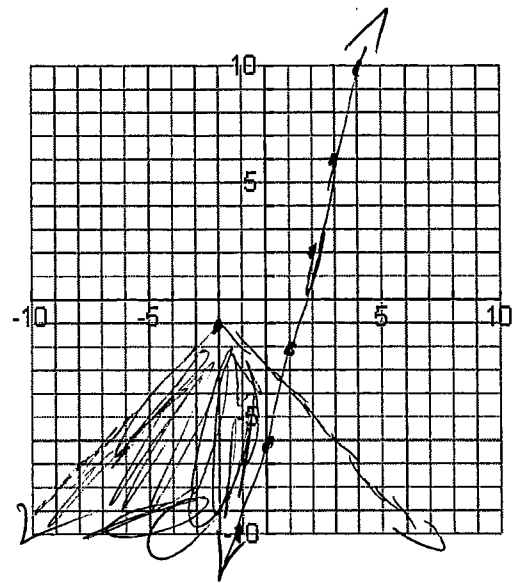
$$4 - 8 + 3 = -1$$



19. Graph the system of inequalities and shade the correct portion. Remember, the solutions need to work for both inequalities.

$$y \geq 4x - 6$$

$$y \leq -|x + 2| - 1$$



b. Give one point that is a solution to your graph at the right.

$$(-2, -5)$$

20. Write the equation of the graph in each form.

Factored:

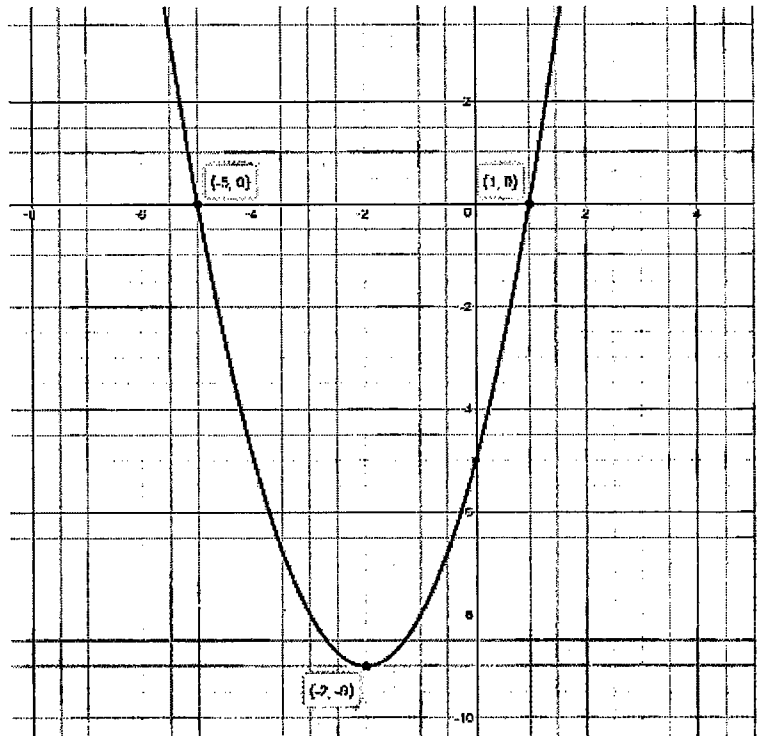
$$y = (x + 5)(x - 1)$$

Standard:

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

Vertex:

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



21. Write an equation of a parabola in vertex form whose vertex is (2, -3) and passes through the point (0,0).

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

$$0 = a(0 - 2)^2 - 3$$

$$0 = 4a - 3$$

$$\begin{array}{r} +3 \\ \hline 3 = 4a \end{array}$$

$$\frac{3}{4} = \frac{4a}{4}$$

$$\frac{3}{4} = a$$

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

22

22. Given $f(x) = 12x - 9(x - 1)$, what is $f(2)$?

$$\begin{aligned}
 f(2) &= 12(2) - 9(2 - 1) \\
 &= 24 - 9(1) \\
 &= 24 - 9 = \boxed{15}
 \end{aligned}$$

23

23. Given $f(t) = \frac{t(2t+3)}{t+6}$, what is $5f(-3)$?

$$\begin{aligned}
 f(-3) &= \frac{(-3)(2(-3)+3)}{(-3)+6} \\
 f(-3) &= \frac{-3(-6+3)}{3}
 \end{aligned}$$

$$\begin{aligned}
 f(-3) &\equiv \frac{-3(-3)}{3} \\
 f(-3) &= \frac{9}{3} = 3
 \end{aligned}$$

$$\begin{aligned}
 5f(-3) &= 5(3) \\
 &= \boxed{15}
 \end{aligned}$$

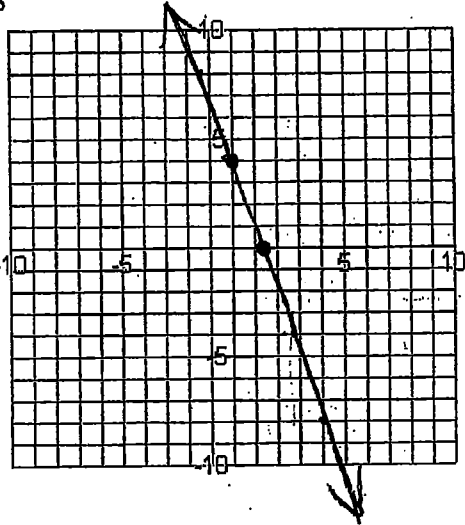
Graph each function WITHOUT A CALCULATOR!

23

23. $6x + 2y = 8$

x-int
 $6x + 2(0) = 8$
 $6x = 8$
 $x = \frac{4}{3} = 1\frac{1}{3}$

y-int
 $6(0) + 2y = 8$
 $2y = \frac{8}{2}$
 $y = 4$

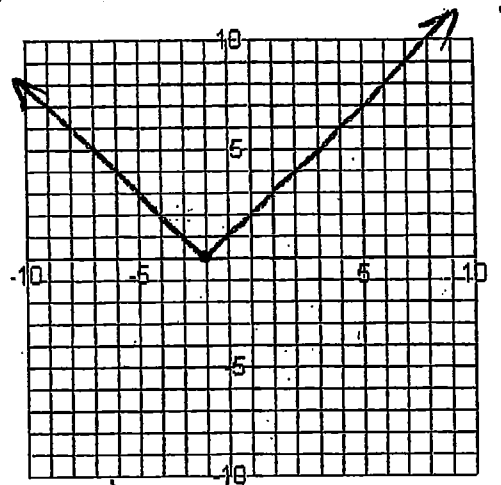


24

24. $y = |x + 2|$

Vertex
 $(-2, 0)$

$a = 1$

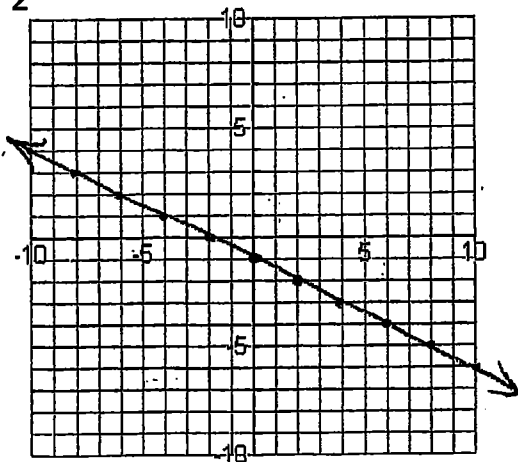


25

25. $y = -\frac{1}{2}x - 1$

$m = -\frac{1}{2}$

$b = -1$



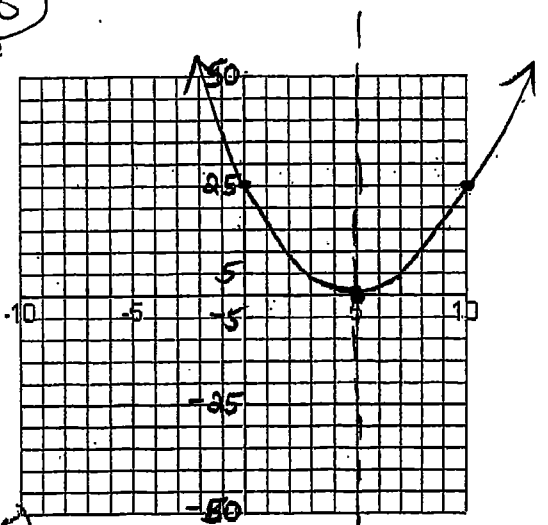
26

26. $y = (x - 5)^2$

Vertex
 $(5, 0)$

$y = (0 - 5)^2$
 $= (-5)^2$
 $= 25$

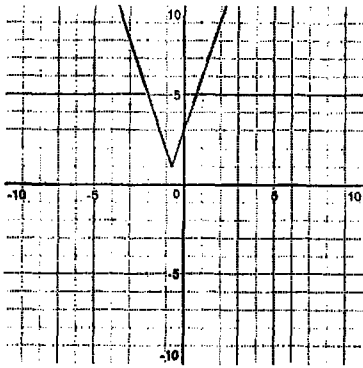
y-int
 $(0, 25)$



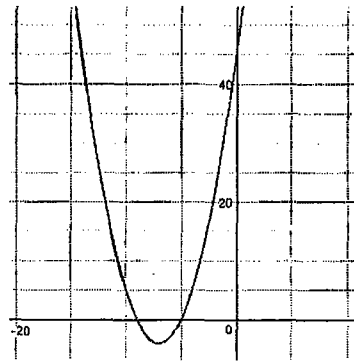
$0 = (x - 5)(x - 5)$
 $x - 5 = 0 \quad x - 5 = 0$
 $+5 +5 \quad +5 +5$
 $x = 5 \quad x = 5$

x-int
 $(5, 0)$

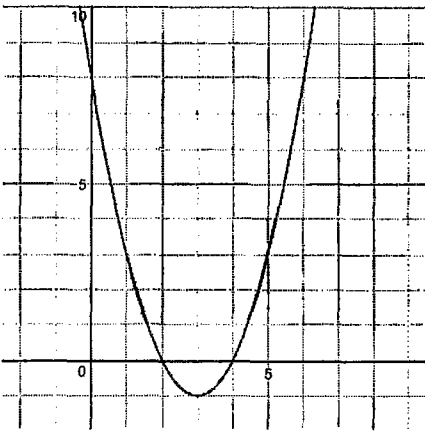
27. $y = |3x + 2| + 1$



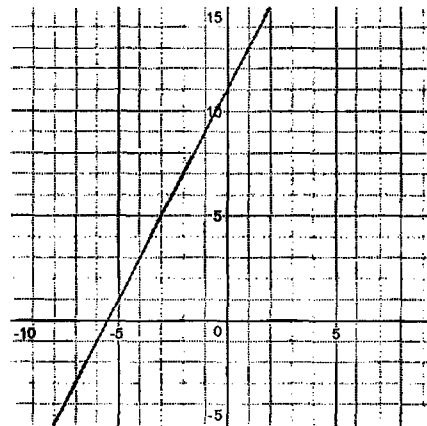
28. $y = (x + 7)^2 - 4$



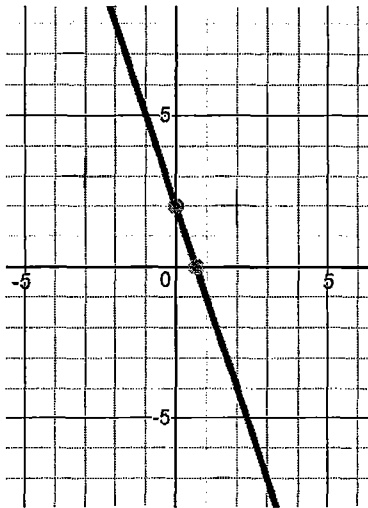
29. Positive x – intercepts, Positive Discriminant



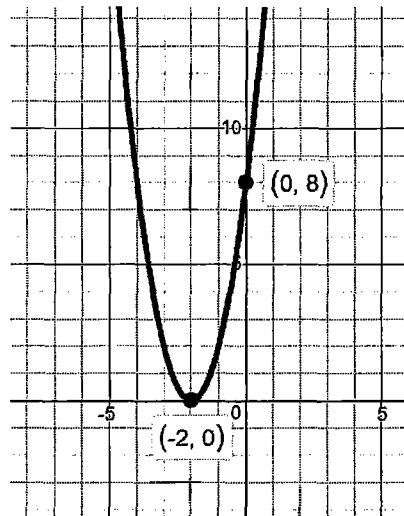
30. $y - 3 = 2(x + 4)$



31. Write the equation of each graph provided.



$m = -2$
 $b = 2$
 $y = -2x + 2$



$y = a(x + 2)^2 + 0$
 $8 = a(0 + 2)^2$
 $8 = 4a$
 $\frac{8}{4} = \frac{4a}{4}$
 $2 = a$
 VERTEX: $(-2, 0)$

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

32. For a model rocket, the altitude h , in meters, as a function of time, in seconds, is given by $h = 68t - 8t^2$.

$$h = -8t^2 + 68t$$

a. What is the maximum height of the rocket?

$$t = \frac{-68}{2(-8)} = \frac{-68}{-16} = \frac{17}{4}$$

$$h = -8\left(\frac{17}{4}\right)^2 + 68\left(\frac{17}{4}\right) = -8\left(\frac{289}{16}\right) + \frac{1156}{4}$$

$$= \frac{-2312}{16} + 289 = -144.5 + 289 = 144.5$$

$$\boxed{144.5 \text{ meters}}$$

b. How long did it take the rocket to reach maximum height?

$$t = \frac{-68}{2(-8)} = \frac{-68}{-16} = \frac{17}{4} = 4.25$$

$$\boxed{4.25 \text{ seconds}}$$

c. How long does it take for the rocket to hit the ground?

$$0 = -8t^2 + 68t$$

$$0 = -4t(2t - 17)$$

$$-4t = 0 \quad 2t - 17 = 0$$

$$-4 = -4 \quad +17 \quad +17$$

$$t = 0 \quad \frac{2t}{2} = \frac{17}{2} \quad t = \frac{17}{2} = 8.5$$

$$\boxed{8.5 \text{ seconds}}$$

Factor each quadratic expression.

33. $-8x^2 + 32$

$$-8(x^2 - 4)$$

$$\boxed{-8(x+2)(x-2)}$$

34. $3x^2 + 13x - 10$

$$\boxed{(3x-2)(x+5)}$$

Solve each equation using any method.

35. $x^2 + 144 = 0$

$$-144 \quad -144$$

$$\sqrt{x^2} = \sqrt{-144}$$

$$\boxed{x = \pm 12i}$$

36. $x^2 - 3x = -2$

$$+2 \quad +2$$

$$x^2 - 3x + 2 = 0$$

$$(x-2)(x-1) = 0$$

$$x-2=0 \quad x-1=0$$

$$+2 \quad +2 \quad +1 \quad +1$$

$$\boxed{x=2} \quad \boxed{x=1}$$

37. $3x^2 - 6x - 12 = 0$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(3)(-12)}}{2(3)}$$

$$x = \frac{6 \pm \sqrt{36 + 144}}{6}$$

$$x = \frac{6 \pm \sqrt{180}}{6} = \frac{6 \pm \sqrt{36 \cdot 5}}{6}$$

$$x = \frac{6 \pm 6\sqrt{5}}{6} = \boxed{1 \pm \sqrt{5}}$$

or $\boxed{-1.24 \text{ and } 3.24}$

38. $4x^2 + 4 = -4x$

$$+4x \quad +4x$$

$$4x^2 + 4x + 4 = 0$$

$$x = \frac{-4 \pm \sqrt{(4)^2 - 4(4)(4)}}{2(4)}$$

$$x = \frac{-4 \pm \sqrt{16 - 64}}{8} = \frac{-4 \pm \sqrt{-48}}{8}$$

$$x = \frac{-4 \pm \sqrt{-16 \cdot 3}}{8} = \frac{-4 \pm 4i\sqrt{3}}{8}$$

$$= \boxed{\frac{-1 \pm i\sqrt{3}}{2}}$$