# ACT Prep (Mr. Palasa) Students

ACT Practice 1

1. Simplify

2. Solve

3. Solve

4. Factor

5. Simplify

6. Expand

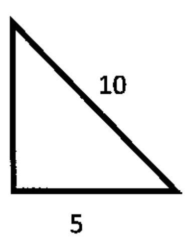
7. Solve

8. Find the mean of the data
34, 56, 95, 43, 68, 71, 82

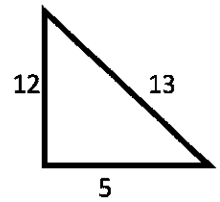
9. Find the center and the radius of the circle

10. Simplify

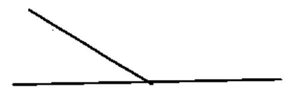
11. Find the missing side




12. Give the 6 trig functions




13. Find x



14. Find the slope of a line $\perp$ 2x-5y= 7

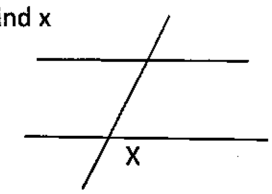
15. Change to radians

16. Compliment of

17. Sum of interior angles of a 9 sided figure

18. Area of a triangle with h= 8 and b=12

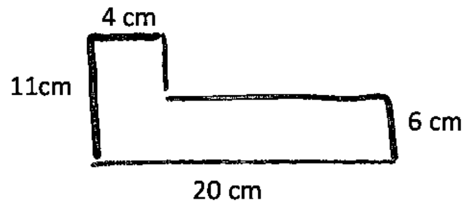
19. Find x



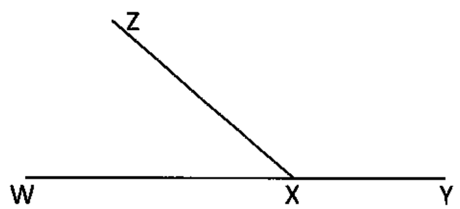

20. Equation of line with slope= 2 and passes through (1,4)

# ACT Practice 2

1. Find the perimeter and area




2. What is the measure of the angle WXZ




3. What is 40% of $180?

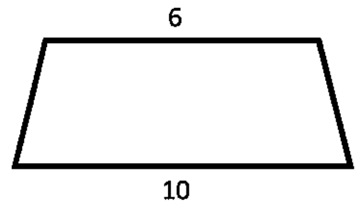
4.

5. Find the midpoint
(7, -2) (3, -5)

6.
Find f(-5)

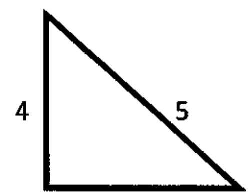
7. The first 4 terms of a geometric sequence are
. What is the 5th term?

8. Find the Area




9. Find the slope

10. What is the sin?




11. Solve

12. r=0
Find the Area and Circumference

ACT Practice 3B

1.

2. 0.75, -3, 12, -48, 192
What is the $6^{th}$ term in the geometric sequence?

3.

4.

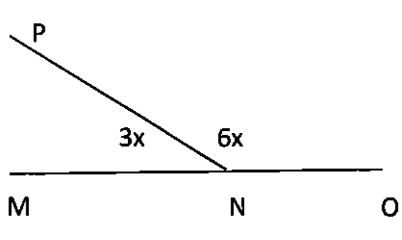
5.

6.
Find the perpendicular slope

7. Find the distance and the midpoint
(3,5) (-4,1)

8. Find the volume of a cube measuring 3 in. on each edge

9. What is the measure of MNP?

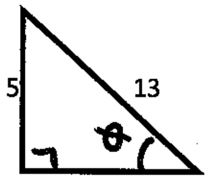



10. Find the area of a trapezoid with a height of 6 in and bases of 9 in and 7 in.

ACT Practice 4

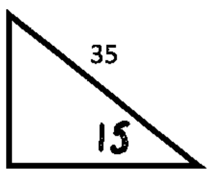
1. Radius is Find the area.

2. Find cos




3. If tan then sin=?

4.




Cos15= 0.966
Tan15= 0.268
Sin15= 0.259

What is the height?

5. Solve

6.

7. (3x+2i)(3x+2i)

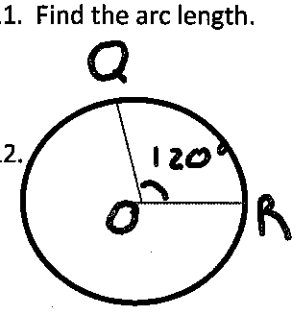
8. 35% of 114 is what?

9.

10. Find the slope
(-4,7) (2,-9)

11. Find the arc length.

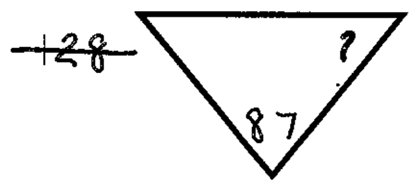
12.




13. Find the center and the radius

14.

15. Find ?




16. 75,600,000+ 300,000=
In scientific notation

17. in radians

18. Factor

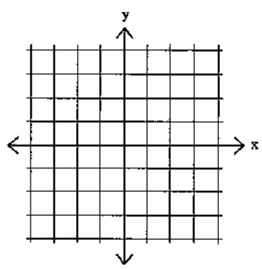
19.

20.

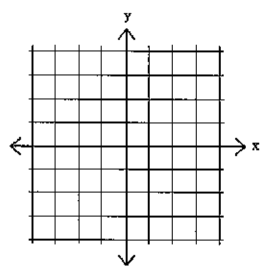
| Slope-Intercept Form | Point-Slope Form | Standard Form |
|---|---|---|
| $y = mx + b$ | $y - y_1 = m(x - x_1)$ | $Ax + By = C$ |
| Used to make graphing easy. | Used to find the equation of a line when given a point on the line and the slope | Used to solve systems of equations |

$$Slope = \frac{change\ in\ y}{change\ in\ x} = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1} = rate\ of\ change$$

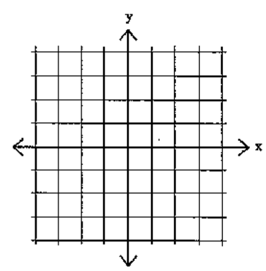
Sketch a line with the given slopes.



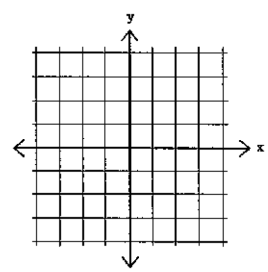

**Positive slope**




**Negative slope**



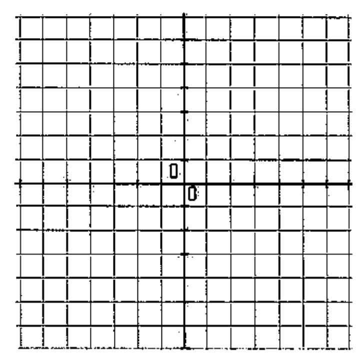

**Zero Slope**




**Undefined**

**Find the slope and y-intercept. Sketch the line.** Label each line with problem on graph.

**Ex2.** $2x + 3y = 0$ **Ex 3.** $y - 4 = 0$ **Ex 4.** $x + 5 = 0$




**Find the slope-intercept form of the equation of the line that passes through the given point and has the indicated slope.**

**Ex 7.** $(-3, 6),\ m = -2$

**Find the *slope-intercept form* of the equation of the line passing through the points.**

**Ex 12.** $(1, 0.6),\ (-2, -0.6)$

# Parallel & Perpendicular Lines

**Parallel Lines**- 2 lines with the same slope, never intersect.

**Perpendicular lines**- intersect to form right angle, slopes are negative reciprocals (change sign & flip fraction).

**Determine if the lines $l_1$ and $l_2$ passing through the pairs of points are parallel, perpendicular or neither.** (Can watch video Equations of Parallel and Perpendicular Lines on Khan Academy if you need review)

**Ex 14.** $l_1$ $(4, 8), (-4, 2)$ $l_2$ $(3, 5), (-1, 2)$

| **Khan Academy Videos:** | **Video 1: Parallel Line Equation (4:24)** | **Video 2: Perpendicular Lines 2 (3:01)** |
|---|---|---|

Write the equation of a line that is parallel to the line $2x - 4y = 8$ and goes through the point (3,0). (Video 1)

Write the equation of a line that is perpendicular to the line $y = 2x + 11$ and goes through the point $(6, -7)$. (Video 2)

Write the equation of a line that is parallel to the line $5x - 3y = 8$ and goes through the point $(-4,1)$.

Write the equation of a line that is perpendicular to the line $y = -3$ and goes through the point $(3, -2)$.

## Section 1.1 – Solving Linear Equations and Inequalities

A. Evaluating Expressions – Examples

Evaluate the following if $a = 7$, $b = 4$, and $c = -2$

1. $(a+c^2)+2b$
2. $2-a+4b-c$

B. The Distributive Property

Try the Following – Simplify each expression.

1. $2(2x-3y)-8(x+4y)$
2. $2(4x-5y)-6(2x-y)$

C. Solving Equations

Try the Following – Solve for $x$.

1. $3(2x+25)-2(x-1)=78$
2. $\frac{3}{4}-\frac{1}{2}x=\frac{4}{5}$
3. $-\frac{8x}{5}+5=-\frac{39}{5}$

D. Solving Formulas

Try the Following – Solve for the variable specified

1. $d=\frac{1}{2}at^2;a$
2. $F=G\frac{Mm}{r^2}\ ;m$

E. Inequalities

Try the following – Solve and graph the inequalities

1. $\frac{3y}{4}+6\geq 3$
2. $\frac{x+8}{4}-1>\frac{x}{3}$
3. $1\leq x-2\leq 7$
4. $-3\leq 2y+9$ or $18>4y-10$

D. Absolute Value – Equations

Try the following – Solve for $x$.

1. $|-8x-3|=1$

2. $|x-2|+7=3$

E. Absolute Value – Inequalities

Try the following – solve and graph.

1. $|2x-5|\leq 7$

2. $|x-5|\geq 12$

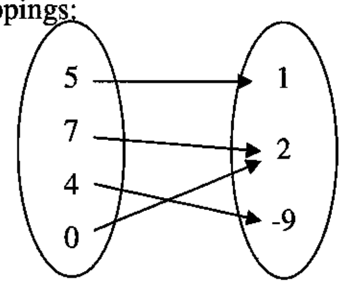
F. $|3x|+3\leq 0$

HW – Worksheet

## Section 1.2 – Linear Relations and Functions

I. Relations and Functions
   A. Definitions
      1. Relation –
      2. Domain –
      3. Range –
      4. Function –

   B. Examples
      1. Determine whether each relation is a function.
         a) Mappings:



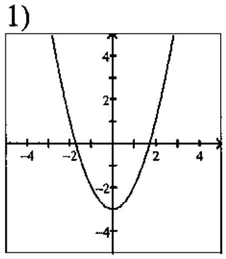

         b) Tables:

| $x$ | $y$ |
|---|---|
| -7 | -12 |
| -4 | -9 |
| 2 | -3 |
| 5 | 0 |

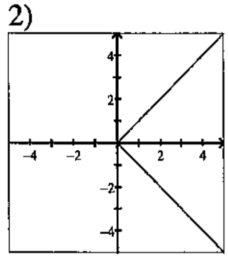
         c) Ordered Pairs: $\{(-5,2),(-2,5),(0,7),(0,9)\}$

      2. Graphs:

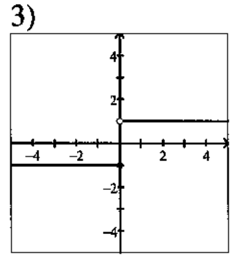
1)



2)



3)



Note: Vertical Line Test –

C. Function Values and Notation

1. Function Notation

a) $y = 3x - 8$ vs. $f(x) = 3x - 8$

b) Function notation has the advantage of clearly identifying the dependent variable $f(x)$ , formerly known as *y*, while at the same time telling you *x* is the independent variable and that the function itself is called "$f$."

c) Function notation allows you to be less wordy. Instead of asking "What is the value of y that corresponds to $x = -2$?" you can ask "What is $f(-2)$?":

2. Examples

a) If $f(x) = x^3 - 3$, find $f(2)$.

b) If $h(x) = 0.3x^2 - 3x - 2.7$, find $h(1.6)$.

c) If $f(x) = x^3 - 3$, find $f(2t)$.

d) Extra: If $g(a) = a^2 - 6$, find $g(b+3)$.

II. Linear Equations

A. Forms

1.

2.

3.

4.

B. Slope and intercepts

1. Slope –

2. *x*-intercept –

3. y-intercept –

C. Examples

1. Find the intercepts and slope of the following:

   a) $3x - 2y = 16$  b) $\frac{1}{4}x - \frac{2}{3}y = 2$  c) $y = \frac{2}{3}x - 5$

2. Find the equation of a line with the following description:

   a) Slope of 3 and goes through the point of (-1,6).

   b) Goes through the points (2,-1) and (5,-8).

   c) Goes through the points (3,-1) and (8,-1).

II. Parallel and Perpendicular

A. Parallel –

B. Perpendicular –

C. Examples:

1. Find an equation of a line that is parallel to $3x - 5y = 7$ and goes through the point (-4,5).

2. Find an equation of a line that is perpendicular to $y = -2x + 5$ and goes through the point (4,12).

III. Modeling Linear Functions

A. The table below shows the approximate percent of students who sent applications to two colleges in various years since 1985. Draw a scatter plot, best fit line, and find an equation that would predict the approximate percent of students who sent applications to two colleges in various years since 1985.
What percent of students sent applications in 1995?
What type of correlation does this data have?

| Years since 1985 | 0 | 3 | 6 | 9 | 12 | 15 |
|---|---|---|---|---|---|---|
| Percent | 20 | 18 | 15 | 15 | 14 | 13 |

IV. Special Functions

A. Direct Variation –

B. Constant Function –

C. Identity Function –

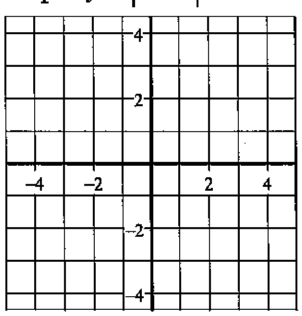
D. Absolute Value Function –

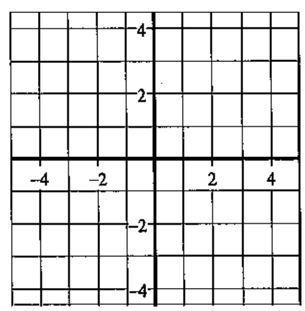
E. Piecewise Function

F. Step Function (Greatest Integer Function) –

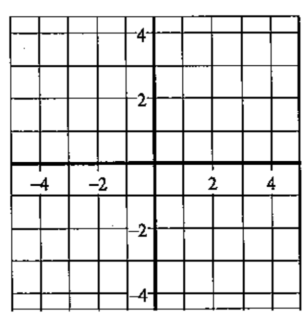
G. Examples

1. Graph $y = |x+2|$




2. Graph $f(x) = \begin{cases} x-1, & \text{if } x \le 3 \\ -1, & \text{if } x > 3 \end{cases}$




3. Graph $y = [\![x-2]\!]$

Homework: Worksheets

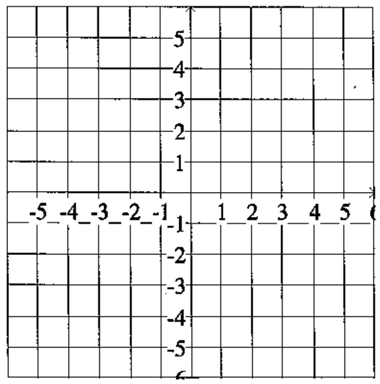
## Section 1.3 – Systems of Linear Equations and Inequalities

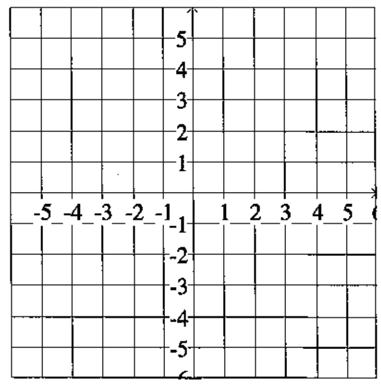
- Solving systems Graphically
  - Types
    - ______________ and ______________
    - ______________ and ______________
    - ______________

  - Examples

    1. $\begin{aligned} x+y&=5 \\ 3x-2y&=20 \end{aligned}$

    2. $\begin{aligned} y&=-3x+5 \\ 9x+3y&=15 \end{aligned}$




- Algebraically
  - Elimination

    1. $\begin{aligned} x+y&=5 \\ 3x-2y&=20 \end{aligned}$

    2. $\begin{aligned} 7x-4y&=17 \\ 3x+5y&=14 \end{aligned}$

  - Substitution

    1. $\begin{aligned} y&=-3x+5 \\ 9x+3y&=15 \end{aligned}$

    2. $\begin{aligned} x+y&=5 \\ 3x-2y&=20 \end{aligned}$

  - Technology

    1. $\begin{aligned} x+y&=5 \\ 3x-2y&=20 \end{aligned}$

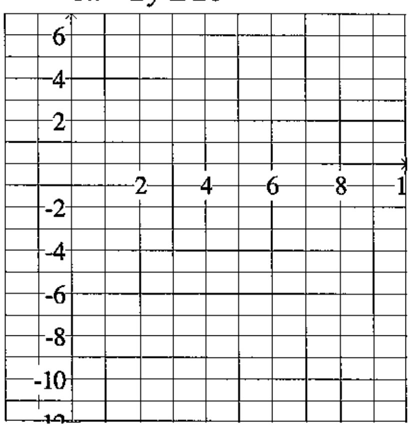
    2. $\begin{aligned} y&=-3x+5 \\ 9x+3y&=15 \end{aligned}$

- Solving Systems Equations in Three Variables

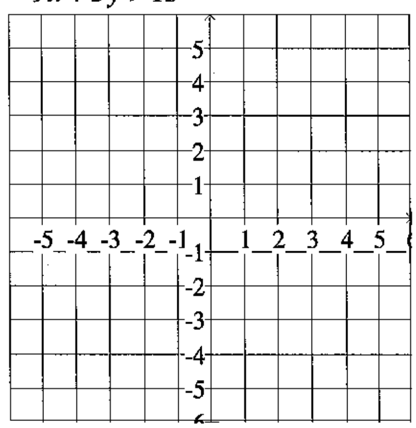
1. There are 49,000 seats in a sports stadium. Tickets for the seats in the upper level sell for \$25, the ones in the middle level cost \$30, and the ones in the bottom level are \$35 each. The number of seats in the middle and bottom levels together equals the number of seats in the upper level. When all of the seats are sold for an event, the total revenue is \$1,419,500. How many seats are there in each level?

- Inequalities

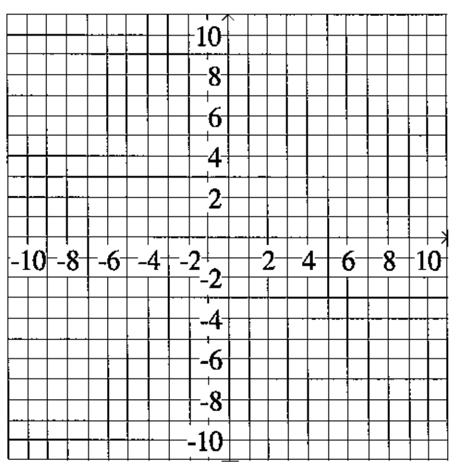
1. $x+y\le 5$
   $3x-2y\le 20$




2. $y<-3x+5$
   $9x+3y>15$




2. $2x+3y\ge 6$
   $3x-2y\ge -4$
   $5x+y\le 15$

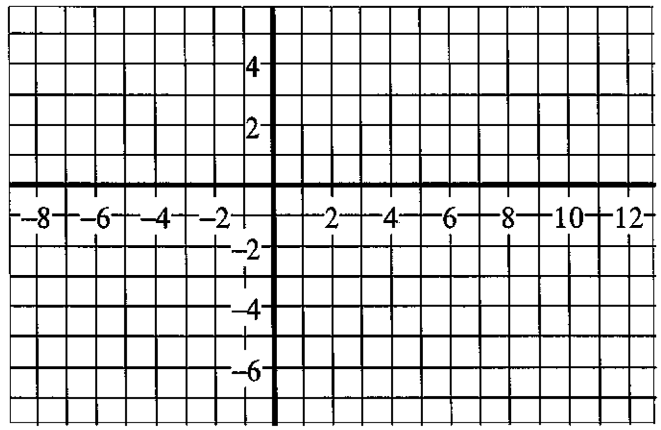


- Linear Programming
  1. Graph the following constraints. Then find the maximum and minimum values of the function $f(x, y) = 3x - 2y$.

     $x \le 5$

     $y \le 4$

     $x + y \ge 2$




  2. A landscaping company has crews who rake leaves and mulch. The company schedules 2 hours for mulching jobs and 4 hours for raking jobs. Each crew is scheduled for no more than 2 raking jobs per day. Each crew's schedule is set up for a maximum of 8 hours per day. On the average, the charge for raking a lawn is $50 and the charge for mulching is $30. Find a combination of raking leaves and mulching that will maximize the income the company receives per day from one of its crews.

     Profit Function:

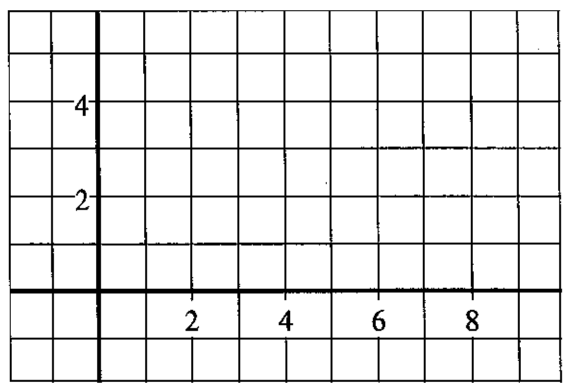
     Constraints:

     a.

     b.

     c.

     d.




Homework – Worksheet

# Appendix E: Solving Linear Equations and Inequalities

## Linear Equations

A *linear equation* in one variable $x$ is an equation that can be written in the standard form $ax + b = 0$, where $a$ and $b$ are real numbers with $a \neq 0$.

A linear equation in one variable, written in standard form, has exactly one solution. To see this, consider the following steps. (Remember that $a \neq 0$.)

$$ax + b = 0 \quad \text{Original equation}$$

$$ax = -b \quad \text{Subtract } b \text{ from each side.}$$

$$x = -\frac{b}{a} \quad \text{Divide each side by } a.$$

To solve a linear equation in $x$, isolate $x$ on one side of the equation by creating a sequence of *equivalent* (and usually simpler) equations, each having the same solution(s) as the original equation. The operations that yield equivalent equations come from the Substitution Principle and the Properties of Equality.

*What you should learn*

- Solve linear equations in one variable.
- Solve linear inequalities in one variable.

*Why you should learn it*

The method of solving linear equations is used to determine the intercepts of the graph of a linear function. The method of solving linear inequalities is used to determine the domains of different functions.

**Generating Equivalent Equations**

An equation can be transformed into an *equivalent equation* by one or more of the following steps.

| | *Original Equation* | *Equivalent Equation* |
|---|---|---|
| **1.** Remove symbols of grouping, combine like terms, or simplify fractions on one or both sides of the equation. | $2x - x = 4$ | $x = 4$ |
| **2.** Add (or subtract) the same quantity to (from) *each* side of the equation. | $x + 1 = 6$ | $x = 5$ |
| **3.** Multiply (or divide) *each* side of the equation by the same *nonzero* quantity. | $2x = 6$ | $x = 3$ |
| **4.** Interchange the two sides of the equation. | $2 = x$ | $x = 2$ |

After solving an equation, check each solution in the original equation. For example, you can check the solution of the equation in Step 2 above as follows.

$$x + 1 = 6 \quad \text{Write original equation.}$$

$$5 + 1 \stackrel{?}{=} 6 \quad \text{Substitute 5 for } x.$$

$$6 = 6 \quad \text{Solution checks. } \checkmark$$

### EXAMPLE 1 Solving Linear Equations

**a.**

| | |
|---|---|
| $3x - 6 = 0$ | Original equation |
| $3x - 6 + 6 = 0 + 6$ | Add 6 to each side. |
| $3x = 6$ | Simplify. |
| $\frac{3x}{3} = \frac{6}{3}$ | Divide each side by 3. |
| $x = 2$ | Simplify. |

**b.**

| | |
|---|---|
| $4(2x + 3) = 6$ | Original equation |
| $8x + 12 = 6$ | Distributive Property |
| $8x + 12 - 12 = 6 - 12$ | Subtract 12 from each side. |
| $8x = -6$ | Simplify. |
| $x = -\frac{3}{4}$ | Divide each side by 8 and simplify. |

■

## Linear Inequalities

Solving a linear inequality in one variable is much like solving a linear equation in one variable. To solve the inequality, you isolate the variable on one side using transformations that produce *equivalent inequalities*, which have the same solution(s) as the original inequality.

**Generating Equivalent Inequalities**

An inequality can be transformed into an *equivalent inequality* by one or more of the following steps.

| | *Original Inequality* | *Equivalent Inequality* |
|---|---|---|
| **1.** Remove symbols of grouping, combine like terms, or simplify fractions on one or both sides of the inequality. | $4x + x \geq 2$ | $5x \geq 2$ |
| **2.** Add (or subtract) the same number to (from) *each* side of the inequality. | $x - 3 < 5$ | $x < 8$ |
| **3.** Multiply (or divide) each side of the inequality by the same *positive* number. | $\frac{1}{2}x > 3$ | $x > 6$ |
| **4.** Multiply (or divide) each side of the inequality by the same *negative* number and *reverse* the inequality symbol. | $-2x \leq 6$ | $x \geq -3$ |

## EXAMPLE 2 Solving Linear Inequalities

**a.** $x + 5 \geq 3$ Original inequality

$x + 5 - 5 \geq 3 - 5$ Subtract 5 from each side.

$x \geq -2$ Simplify.

The solution is all real numbers greater than or equal to $-2$, which is denoted by $[-2, \infty)$. Check several numbers that are greater than or equal to $-2$ in the original inequality.

**b.** $-4.2m > 6.3$ Original inequality

$\frac{-4.2m}{-4.2} < \frac{6.3}{-4.2}$ Divide each side by $-4.2$ and reverse inequality symbol.

$m < -1.5$ Simplify.

The solution is all real numbers less than $-1.5$, which is denoted by $(-\infty, -1.5)$. Check several numbers that are less than $-1.5$ in the original inequality. ■

**Remark**

Remember that when you multiply or divide by a negative number, you must *reverse the inequality symbol,* as shown in Example 2(b).

## E Exercises

See *CalcChat.com* for tutorial help and worked-out solutions to odd-numbered exercises. For instructions on how to use a graphing utility, see Appendix A.

### *Vocabulary and Concept Check*

**In Exercises 1 and 2, fill in the blank.**

1. A _______ equation in one variable $x$ is an equation that can be written in the standard form $ax + b = 0$.
2. To solve a linear inequality, isolate the variable on one side using transformations that produce _______ .

### *Procedures and Problem Solving*

**Solving Linear Equations** **In Exercises 3–24, solve the equation and check your solution.**

3. $x + 11 = 15$
4. $x + 3 = 9$
5. $x - 2 = 5$
6. $x - 5 = 1$
7. $3x = 12$
8. $2x = 6$
9. $\frac{x}{5} = 4$
10. $\frac{x}{4} = 5$
11. $8x + 7 = 39$
12. $12x - 5 = 43$
13. $24 - 7x = 3$
14. $13 + 6x = 61$
15. $8x - 5 = 3x + 20$
16. $7x + 3 = 3x - 17$
17. $-2(x + 5) = 10$
18. $4(3 - x) = 9$
19. $2x + 3 = 2x - 2$
20. $8(x - 2) = 4(2x - 4)$
21. $\frac{3}{2}(x + 5) - \frac{1}{4}(x + 24) = 0$
22. $\frac{3}{2}x + \frac{1}{4}(x - 2) = 10$
23. $0.25x + 0.75(10 - x) = 3$
24. $0.60x + 0.40(100 - x) = 50$

**Solving Linear Inequalities** **In Exercises 25–46, solve the inequality and check your solution.**

25. $x + 6 < 8$
26. $3 + x > -10$
27. $-x - 8 > -17$
28. $-3 + x < 19$
29. $6 + x \leq -8$
30. $x - 10 \geq -6$
31. $\frac{4}{5}x > 8$
32. $\frac{2}{3}x < -4$
33. $-\frac{3}{4}x > -3$
34. $-\frac{1}{6}x < -2$
35. $4x < 12$
36. $10x > -40$
37. $-11x \leq -22$
38. $-7x \geq 21$
39. $x - 3(x + 1) \geq 7$
40. $2(4x - 5) - 3x \leq -15$
41. $7x - 12 < 4x + 6$
42. $11 - 6x \leq 2x + 7$
43. $\frac{3}{4}x - 6 \leq x - 7$
44. $3 + \frac{2}{7}x > x - 2$
45. $3.6x + 11 \geq -3.4$
46. $15.6 - 1.3x < -5.2$

Pre-Calculus/Trig 3 Name ______________________

Solving Exponential/Logarithmic Equations Worksheet

Solve each of the following exponential equations.

1. $10^x = 42$
2. $\frac{1}{3}10^{2x} = 12$
3. $3(10^{x-1}) = 2$
4. $e^x = 10$
5. $2^{3x} = 565$
6. $1000e^{-4x} = 75$
7. $25e^{2x+1} = 962$
8. $\frac{1250}{(1.04)^x} = 500$
9. $e^{.09t} = 3$
10. $\frac{10000}{1+19e^{-t/5}} = 2000$
11. $80e^{-t/2} + 20 = 70$
12. $e^x = 6500$
13. $3^{2x+1} = 5^{x+2}$
14. $10^{7-x} = 5^{x+1}$
15. $4^{x^2} = 100$
16. $3(1+e^{2x}) = 4$
17. $20(100 - e^{x/2}) = 500$
18. $\frac{400}{1+e^{-x}} = 200$
19. $\frac{3000}{2+e^{-2x}} = 1200$
20. $\frac{e^x + e^{-x}}{2} = 2$

Solve each of the following logarithmic equations. Round to three decimal places.

1. $\ln x = 5$
2. $2\ln x = 7$
3. $2\ln 4x = 0$
4. $\log(z-3) = 2$
5. $\ln 2x = -1$
6. $3\ln 5x = 10$
7. $6\ln(x+1) = 2$
8. $\log x^2 = 20$
9. $\ln\sqrt{x+2} = 1$
10. $\ln x + \ln(x-2) = 1$
11. $\log 2 + \log x = 3$
12. $\log x - \log 3 = 15$
13. $\log(x+4) - \log x = \log(x+2)$
14. $\log x - \log(2x-1) = 0$
15. $\ln x + \ln(x+3) = 1$
16. $\log_2(x+5) - \log_2(x-2) = 3$
17. $\log_4 x + \log_4(x-2) = 6$
18. $\ln x + \ln(x+3) = 10$
19. $\log_4 x - \log_4(x-1) = \frac{1}{2}$
20. $\log x^2 = 2000$

## 3.3 Corrective Assignment – Piecewise Functions

Name: ____________________________

Pre-Calculus

**Find the value of the given function at the indicated domain value.**

$$g(x)=\begin{cases} x^2+2x-5, & x<-3 \\ 4-x^3, & -3\le x<9 \\ 2+\sqrt{x-9}, & x>9 \end{cases} \qquad h(x)=\begin{cases} -x^2-4x+8, & x\le -5 \\ 2x^3, & -5<x<0 \\ |7-x|+11, & x\ge 0 \end{cases}$$

1. $g(-3) =$

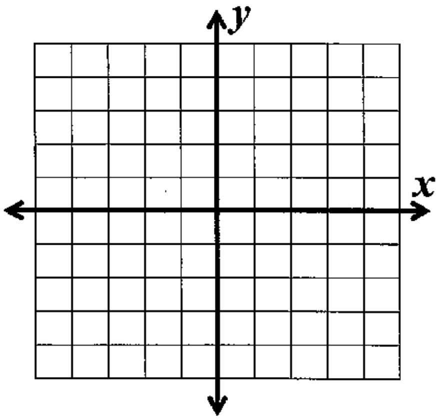
2. $h(-7) =$

3. $h(0) =$

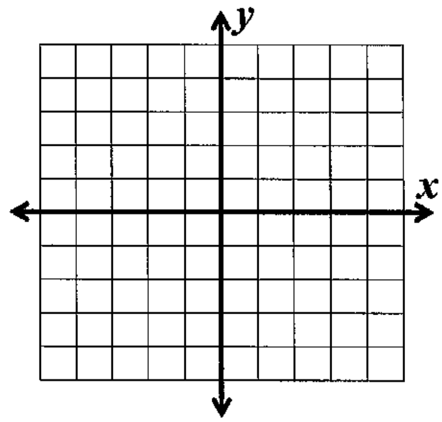
4. $g(9) =$

**Graph the following piecewise functions.**

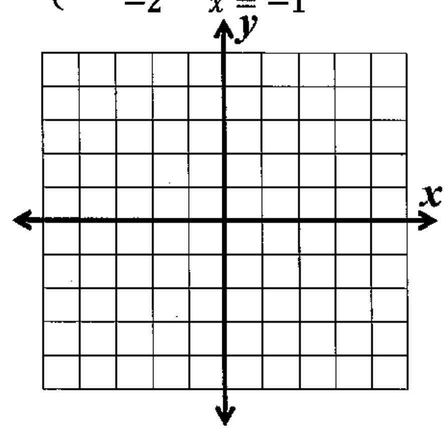
5. $f(x) = \begin{cases} |x+3|, & x\le -2 \\ x+1, & -2<x\le 3 \\ -x+5, & x>3 \end{cases}$




6. $h(x) = \begin{cases} \frac{3}{2}x+2, & x\le -1 \\ x^2-5, & -1<x\le 3 \\ -|x-4|+1 & x>3 \end{cases}$



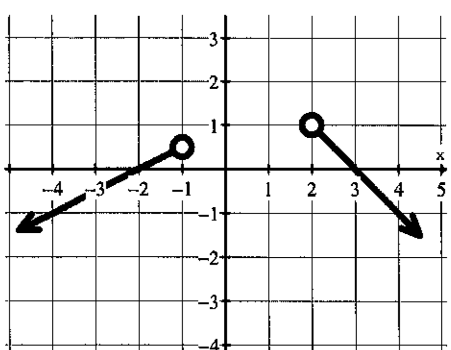

7. $g(x) = \begin{cases} 5, & x<-4 \\ -x+1, & -4\le x<-1 \\ x+3, & -1<x\le 2 \\ 5 & x>2 \\ -2 & x=-1 \end{cases}$




**Given the graph of $f$, write out the function's equation.**

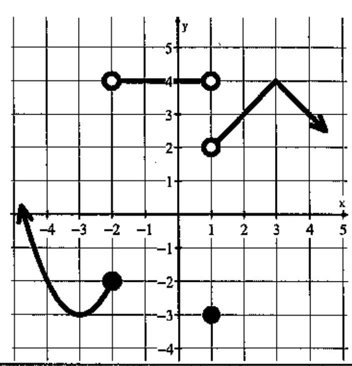
8.

$f(x) =$




9.

$f(x) =$




**Tell if the function is continuous. Show any work that leads to your conclusion.**

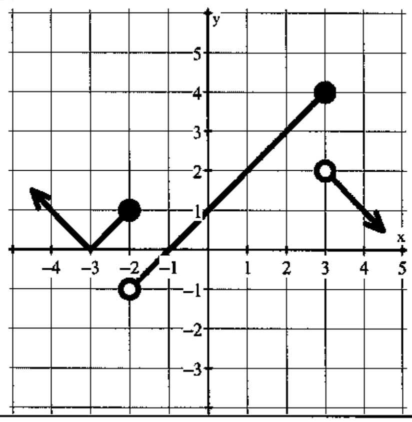
10. $h(x) = \begin{cases} 7-x, & x<-4 \\ 3x+21, & x\ge -4 \end{cases}$

11. $g(x) = \begin{cases} x-9, & x<3 \\ x-x^2, & x>3 \\ -6 & x=3 \end{cases}$

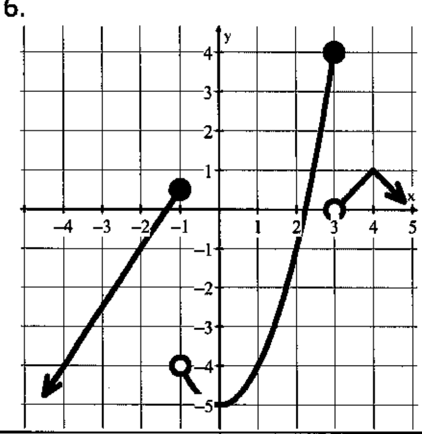
# ANSWERS to 3.3 Corrective Assignment

| | | | |
|---|---|---|---|
| 1. 31 | 2. −13 | 3. 18 | 4. Undefined |

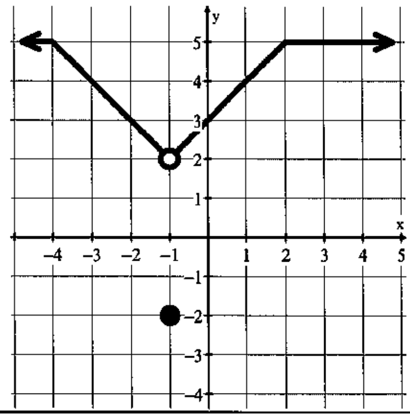
5.



6.



7.



8. $f(x) = \begin{cases} \frac{1}{2}x + 1, & x < -1 \\ -x + 3, & x > 2 \end{cases}$

9. $f(x) = \begin{cases} (x+3)^2 - 3, & x \le -2 \\ 4, & -2 < x < 1 \\ -3, & x = 1 \\ -|x-3| + 4, & x > 1 \end{cases}$

| | |
|---|---|
| 10. Not continuous | 11. Continuous |

# 3.3 Piecewise Functions

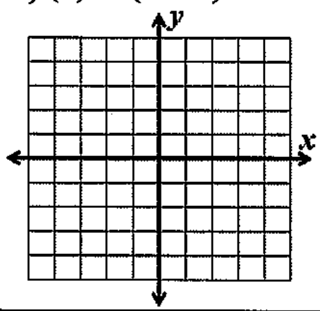
Name:____________________



## Recall:

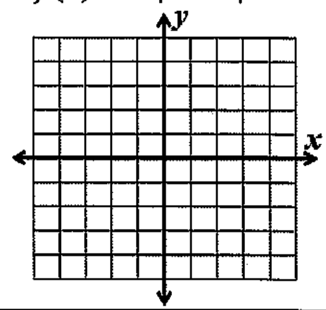
Quadratic Function:

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




Absolute Value Function

$f(x) = -|x+3| + 2$




## Finding the Value

1. $f(x) = \begin{cases} -x^2 - 2x + 8, & x \le -3 \\ 3x + x^3, & -2 < x < 5 \\ -|x-8|, & x \ge 5 \end{cases}$

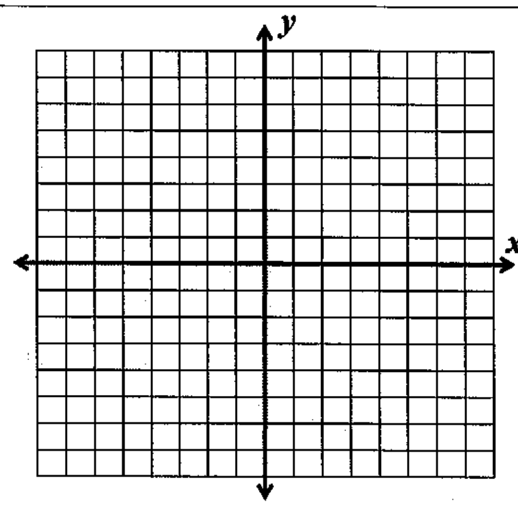
$f(-1) =$

$f(5) =$

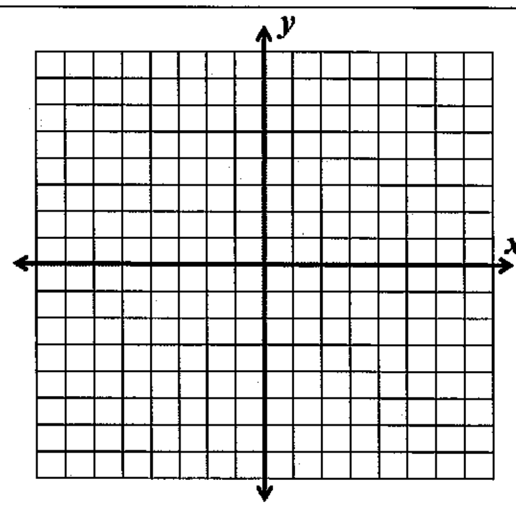
$f(-2.5) =$

## Graphing a Piecewise Function

2. $g(x) = \begin{cases} -x - 3, & x \le -2 \\ 4, & -2 < x \le 1 \\ 2x - 5, & x > 1 \end{cases}$



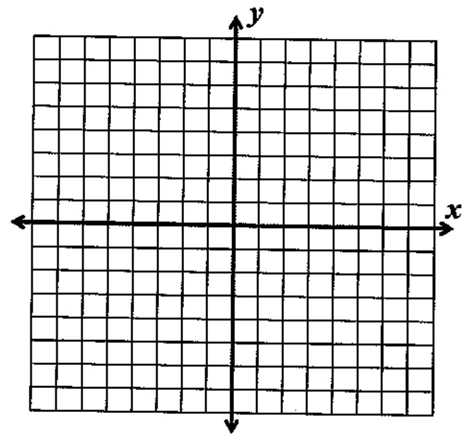

3. $h(x) = \begin{cases} -(x+1)^2 + 7, & x < 2 \\ -\frac{1}{3}x, & x > 4 \end{cases}$



# 3.3 Piecewise Functions

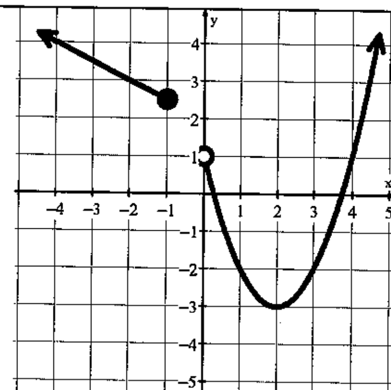


4. $f(x) = \begin{cases} (x+3)^2 - 5, & x < -2 \\ -1, & -2 \le x < 1 \\ -|x-4| + 4, & x > 2 \end{cases}$




5. Write out the function of the graph to the right.

$f(x) =$




**Tell if the functions are continuous. Show any work that leads to your conclusion.**

6.

$f(x) = \begin{cases} 2x^2 - x + 1, & x < -1 \\ x^3 + 6x^2 + 12x + 11, & x \ge -1 \end{cases}$

7.

$f(x) = \begin{cases} -x^2 + 8, & x \le 3 \\ -2 - 3\sqrt{3-x}, & x > 3 \end{cases}$

**Skills Review:** Solve or evaluate.

| | | | |
|---|---|---|---|
| 1. $\sqrt{-24}$ | 2. $x^2 - 2 = -100$ | 3. $(x+4)^2 - 7 = 57$ | 4. $2(x-9)^2 + 11 = -25$ |

## 3.3 Practice – Piecewise Functions

Name: ______________________

Pre-Calculus

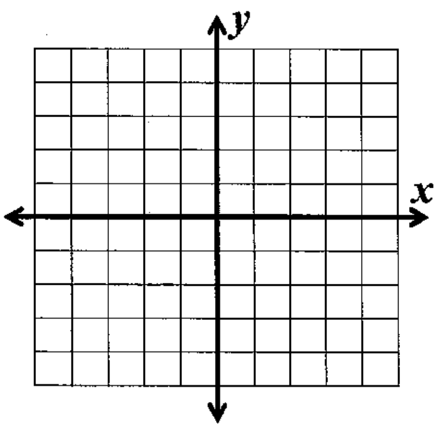
**Find the value of the given function at the indicated domain value.**

$$g(x) = \begin{cases} -x^2 - 5x + 2, & x < 1 \\ x^3 - 5x, & 1 \le x < 11 \\ -\sqrt{3x - 16}, & x \ge 11 \end{cases} \qquad h(x) = \begin{cases} 2x^2 - 2x + 1, & x \le -6 \\ 3x - x^3, & -3 < x \le 1 \\ 2x - |x - 10|, & x > 1 \end{cases}$$

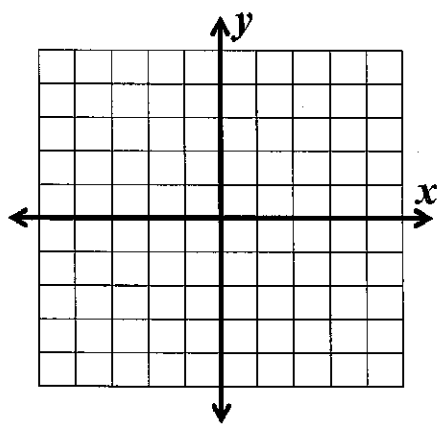
| | | | |
|---|---|---|---|
| 1. $g(1) =$ | 2. $g(11) =$ | 3. $h(5) =$ | 4. $h(-10) =$ |
| 5. $g(-1) =$ | 6. $h(0) =$ | 7. $g(20) =$ | 8. $h(-4) =$ |

**Graph the following piecewise functions.**

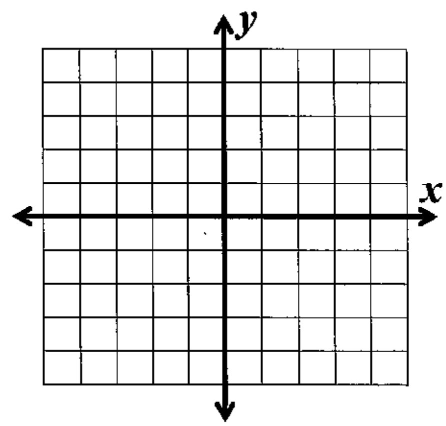
9.
$$f(x) = \begin{cases} -2x - 1, & x < -2 \\ -2, & -2 \le x \le 3 \\ -x + 5, & x > 3 \end{cases}$$



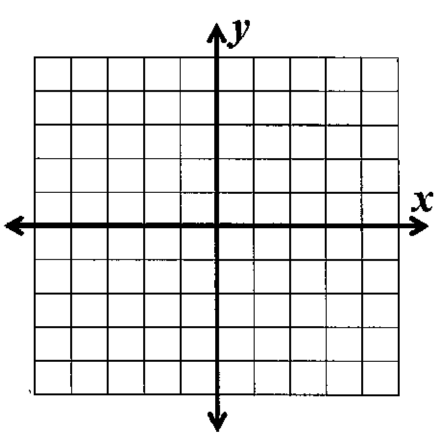

10.
$$f(x) = \begin{cases} -4, & -5 \le x \le -3 \\ -1, & -3 < x \le 0 \\ 2, & 0 < x \le 1 \\ 5, & 2 < x \le 4 \end{cases}$$



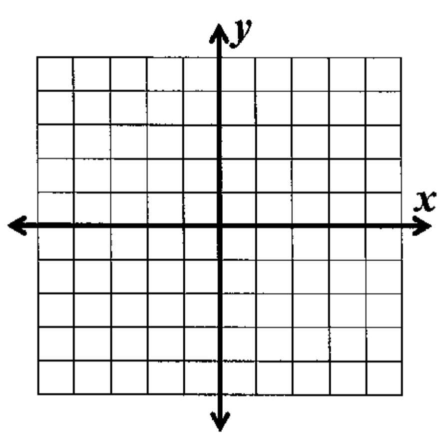

11.
$$h(x) = \begin{cases} \frac{2}{3}x + 2, & x < -1 \\ (x - 1)^2 - 4, & x > 0 \end{cases}$$



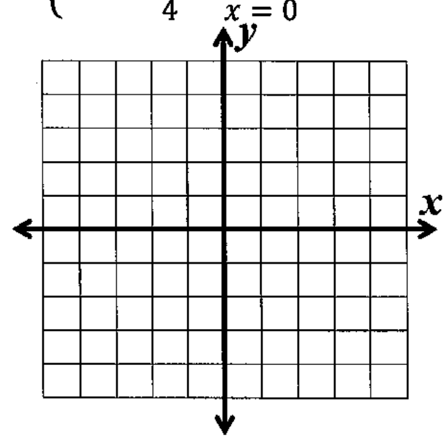

12. $f(x) =$
$$\begin{cases} -|x + 2| + 1, & x < -1 \\ -x, & -1 \le x \le 2 \\ x, & x > 2 \end{cases}$$




13. $h(x) =$
$$\begin{cases} 3x + 10, & x < -3 \\ -x^2 + 5, & -3 \le x < 1 \\ 2, & x = 1 \\ |x - 3| - 3 & x > 1 \end{cases}$$



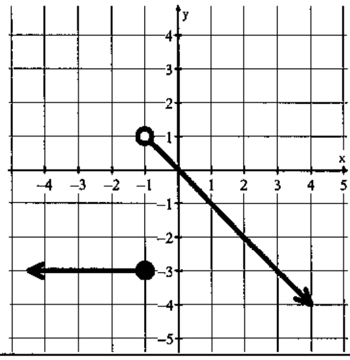

14. $g(x) =$
$$\begin{cases} -3, & x < -3 \\ 2x + 3, & -3 \le x < 0 \\ -2x + 3, & 0 < x \le 3 \\ -3 & x > 3 \\ 4 & x = 0 \end{cases}$$



**Given the graph of $f$, write out the function's equation. Use a linear expression ($mx + b$) for straight lines, absolute values if there is a "V" graph.**

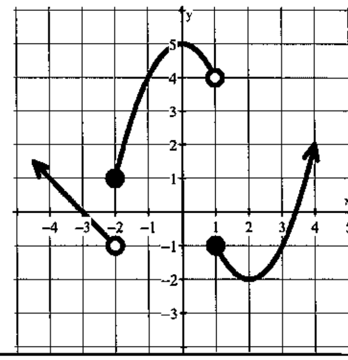
15.

$f(x) =$



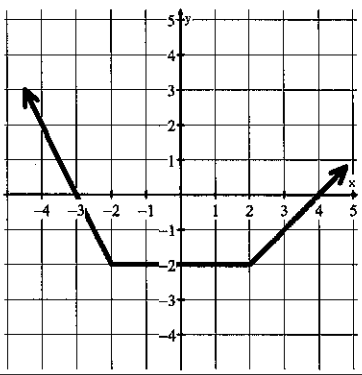
16.

$f(x) =$



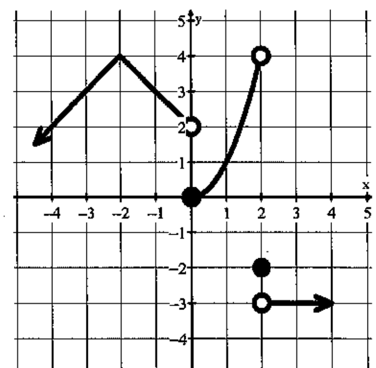
17.

$f(x) =$



18.

$f(x) =$



**Tell if the function is continuous. Show any work that leads to your conclusion.**

19. $h(x) = \begin{cases} x+1, & x < 2 \\ 2x-1, & x \geq 2 \end{cases}$

20. $g(x) = \begin{cases} x+3, & x < -1 \\ x^2 - x, & x > -1 \\ 3 & x = -1 \end{cases}$

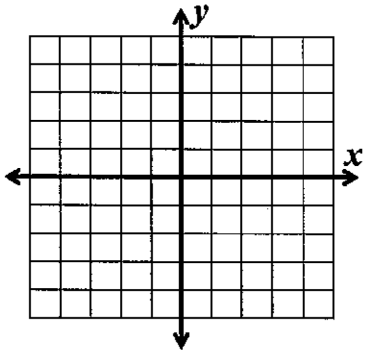
21. $f(x) = \begin{cases} 4x^2 - 2x, & x < 3 \\ 10x, & x = 3 \\ 30, & x > 3 \end{cases}$

22. $f(x) = \begin{cases} 21 - 3x, & x < 5 \\ 2x - 4, & x > 5 \end{cases}$

# 3.3 *Application and Extension*

**1. Change the following absolute value function into a piecewise function by following the steps.**

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




b) Change the "absolute value" symbols to parentheses, and simplify the function

This is the "positive slope" side of the function.

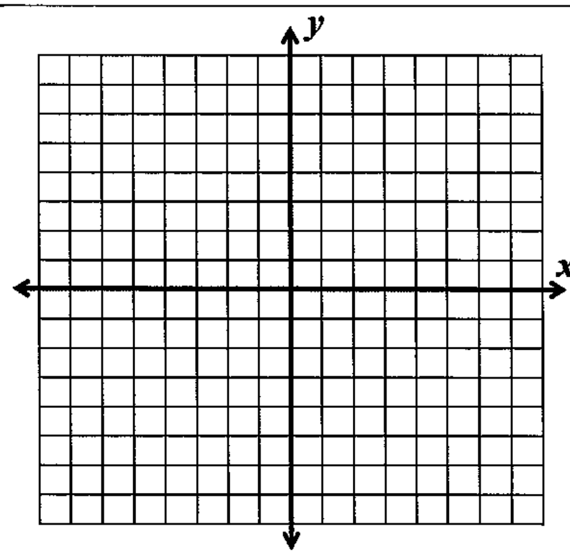
c) Do the same thing you did in step *b* above, but change the slope to the opposite sign.

This is the "negative slope" side of the function.

d) Using steps *b*-*c* to help, write the function from step *a* as a piecewise function.

$f(x) = \{$

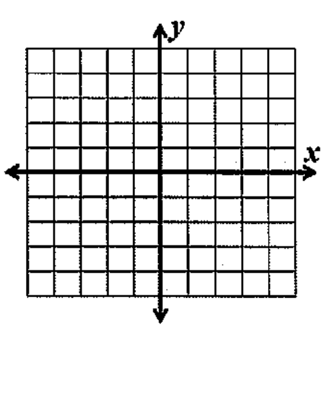
2. Rewrite the function $f(x) = -\frac{5}{3}|x-3| + 4$ as a piecewise function and graph it.




$f(x) = \{$

3. The Greatest Integer Function (also called a "step" function) is modeled by the equation $f(x) = [\![x]\!]$. When you plug in a value for $x$, it returns the largest integer less than or equal to $x$. To the right is a table of a few input and output values. Finish the table and plot the points. Then graph and write a piecewise function for the domain $-2 \le x < 2$.

| x | f(x) |
|---|---|
| -2 | -2 |
| -1.78 | -2 |
| -1 | -1 |
| -0.5 | -1 |
| -0.01 | -1 |
| 0.3 | 0 |
| 0.8 | |
| 1 | |
| 1.4 | |
| 1.9999 | |




$f(x) = \{$

**What value(s) of $k$ would make the following functions <u>continuous</u>.**

4. $g(x) = \begin{cases} x+1, & x \le 2 \\ kx+6, & x > 2 \end{cases}$

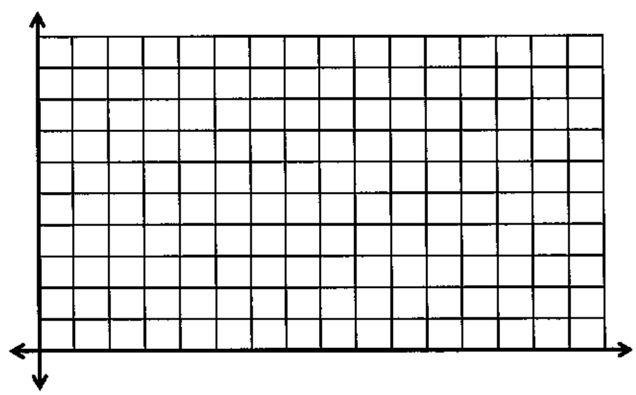
5. $h(x) = \begin{cases} 2x+3, & x < -1 \\ 7x-k, & x \ge -1 \end{cases}$

6. $f(x) = \begin{cases} 3x^2-11x-4, & x \le 4 \\ kx^2-2x-1, & x > 4 \end{cases}$

7. $w(x) = \begin{cases} -6x-12, & x < -3 \\ k^2-5k, & x = -3 \\ 6, & x > -3 \end{cases}$

8. Kelly and Sullivan are planning their trip to the annual Star Trek convention. They need to rent a car to get there and find one car rental agency that charges \$0.25 per mile if the total mileage does not exceed 100. If the total mileage exceeds 100, the agency charges \$0.25 per mile for the first 100 miles and only \$0.15 per mile for each mile over 100. If $m$ represents the number of miles a rented vehicle is driven, express the mileage charge $C(m)$ as a function of $m$. Find $C(50)$ and $C(150)$, and graph $C$. (*This is not as easy as it first appears! The 2nd piece is challenging to figure out.)*

$C(m) = \begin{cases} \\ \\ \end{cases}$



$C(50) =$

$C(150) =$