

Grouping	
exp	(roots)
mult	div
add	sub

## Elementary Algebra Review for Test 2 Fall 2005 Mike Huff

### Exponents and the Order of Operations

Exercise 1: Evaluate each expression.

a)  $-3^2 \cdot 5 - 3^2 \div 3$  -48

b)  $\left(\frac{5}{3} - \frac{2}{5}\right)^2 - 3 \cdot \frac{1}{2}$  47  
450

c)  $[(2-3)^3 - 3^2] \cdot 3 - 4$  -34

d)  $-4^3 \div 4^2 - 2(3-7)^3$  124

e)  $3[6 - (4 - 3^2)] - 30$  3  
 $3\{6 - (-5)\} - 30$   
 $3(11) - 30$   
 $33 - 30$

### Evaluating Variable Expressions

Exercise 2: Evaluate each expression for the given value of the variable.

a)  $3x - 5 + 4x$  for  $x = -\frac{1}{2}$  -17  
2

b)  $3x^2 - 6x - 4$  for  $x = -\frac{1}{2}$   
-4

c)  $-x^2 - 6x + 2$  for  $x = -1$

d)  $(2x^2 - 1)(x - 1)$  for  $x = -2$

### Algebraic Expressions - Combining Like Terms

Exercise 3: Distribute and Combine Like Terms

a)  $-2(-2 - 4x)$  4 + 8x

b)  $-2\left(-2x - 2 - \frac{3}{2}y\right)$  4x + 4 + 3y

c)  $-2(2 - 3x) - 3(-x + 2)$   
9x - 10

a)  $-(3 - x) - 2(-2x + 3)$  5x - 9

b)  $-\frac{1}{2}(4 - 8x) - \frac{1}{3}(-3x - 6)$   
 $-2 + 4x + x + 2$   
 $= 5x$

### Solving Equations Containing Grouping Symbols

Exercise 4: Solving Equations

a)  $10(x - 3) = 5(-2x + 3)$  x = 9/4

b)  $0 = 3(x + 2) - 3(x - 5)$

c)  $3(x - 1) - 5(x - 2) = 4(x - 2)$  x = 5/2

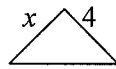
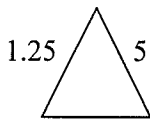
d)  $2(x - 2) + 3 = 6x + 1 + 4x$  x = -1/4

e) Solve:  $\frac{2}{3}\left(\frac{7}{8} - 4x\right) - \frac{5}{8} = \frac{3}{8}$

x = -5/32

**Exercise 5: Ratios and Proportions**

- Write as a rate in lowest terms: 20 people to 16 square miles.  $\frac{20}{16}$   $\frac{\text{people}}{\text{miles}}$
- Write the answer to the question above as a unit rate.  $\frac{5}{4}$  ppl/mile
- A 12-lb bag of fertilizer will cover an area of 1500 square feet. How many pounds will be needed to cover an area of 18,000 square feet? 144 lbs
- If Cecile made \$11.50 after working 2 hours at her job, how much does she earn if works 23 hours?  $\frac{\$}{\text{hrs}} \frac{11.50}{2} = \frac{X}{23}$   $2X = 11.50(23)$  \$132.25 for 23 hrs
- Assume the figures are similar and solve for the indicated lengths.



$$\frac{x}{1.25} = \frac{4}{5}$$

$$5x = 4(1.25) \quad \boxed{x=1}$$

- If you can travel 315 miles on 14 gallons of gas, how many gallons will you need to travel 525 miles?  $\frac{\text{miles}}{\text{gallons}} \frac{315}{14} = \frac{525}{x}$   $315x = 525(14)$   $23\frac{1}{3}$  gallons

**Exercise 6: Formulas**

a) Solve for  $x$ :  $y = mx + b$

$$\boxed{x = \frac{y-b}{m}}$$

b) Solve for  $d$ .  $F = \frac{c+2d}{3}$

$$\boxed{d = \frac{3F-c}{2}}$$

c) Solve for  $t$ :  $A = P + Prt$

$$\boxed{t = \frac{A-P}{Pr}}$$

d) Solve for  $P$ :  $A = P + Prt$

$$\boxed{P = \frac{A}{1+rt}}$$

e) Solve for  $l$ :  $P = 2l + 2wl$

$$\boxed{l = \frac{P-2w}{2}}$$

f) Given  $C = \frac{5}{9}(F - 32)$ , find  $F$  when  $C = 71$

$$\boxed{159.8^\circ}$$

g) Given  $A = P(1 + rt)$ , find  $A$  when  $t = 5$ ,  $r = 0.05$ , and  $P = 1000$ .

$$\boxed{A = 1250}$$

h) Given  $y = mx + b$  find  $x$  when  $y = 15$ ,  $b = 5$ , and  $m = 2$ .

$$\boxed{x=5}$$

**Translation**

**Exercise 7: Translate to a mathematical expression carefully labeling the variable.**

a) Three less than twice a number

$$\boxed{2x-3}$$

b) The difference between five and a number.

$$\boxed{5-x}$$

c) Five times the sum of seven and a number.

$$\boxed{5(7+x)}$$

d) One more than four times a number.

$$\boxed{4x+1}$$

**Exercise 8: Word Problems**

1. Your bill for lunch was \$13.23. This included 8% sales tax. What was the cost of the meal without tax?

$$x + .08x = 13.23$$

The meal before tax was \$12.25

2. After a 25% discount, a new CD player was selling for \$146.25. What was the original price of the CD player?

$$x - .25x = 146.25$$

$$.75x = 146.25$$

The original cost was \$195.00.

3. The second angle of a triangle is twice as large as the first. The third angle is 30° more than the sum of the first two angles. What is the measure of each angle?

$$m\angle 1 = 25^\circ \quad m\angle 2 = 50^\circ \quad m\angle 3 = 105^\circ$$

4. The number of gallons of tea  $n$  consumed by the average U.S. consumer can be approximated by  $n = \frac{1}{10}d + 7$ , where  $d$  is the number of years since 1991.

- a) How many gallons were consumed by the average U.S. consumer in 2000? **7.9 gallons**  
 b) In what year will the average number of gallons consumed be 10? **Year 2021**

5. Consumer experts advise us to never pay the sticker price for a car. A rule of thumb is to pay the sticker price minus 20% of the sticker price, plus \$200. A car is purchased for \$11,520 using the rule. What was the sticker price?

$$x - .20x + 200 = 11,520$$

The car sticker price was \$14,150

6. Two angles are complementary. If the measure of one angle is six degrees less than twice the measure of the second, find the measure of each angle.

$$x + (2x - 6) = 90$$

$$m\angle 1 = 32^\circ \quad m\angle 2 = 58^\circ$$

7. Two angles are supplementary. If the measure of one angle is five degrees less than four times the measure of the second, find the measure of each angle.

$$m\angle 1 = 143^\circ \quad m\angle 2 = 37^\circ$$

$$4x - 5 + x = 180$$

8. The measure of the second angle of a triangle is twice the measure of the first. The measure of the third angle of a triangle is eight less than the measure of the first. Find the measure of all three angles.

$$m\angle 1 = 94^\circ$$

$$m\angle 2 = 47^\circ$$

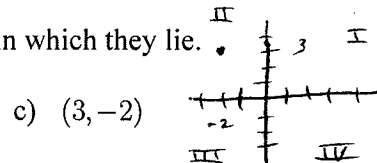
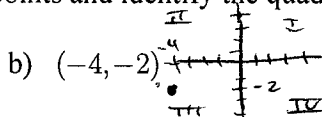
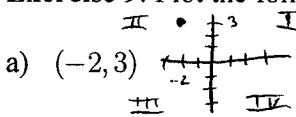
$$m\angle 3 = 39^\circ$$

$$(2x) + (x) + (x - 8) = 180$$

Comp = 90°  
 Supp = 180°

**Graphs and the Cartesian Coordinate System**

**Exercise 9:** Plot the following points and identify the quadrant in which they lie.



**Definitions:** A **solution** of an equation in two variables is an ordered pair that makes the equation true.

**Exercise 10:** Determine if the ordered pair is a solution of the equation.

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

c)  $(-2, 7)$   $y = x^2 + 3$

b)  $(-4, -2)$   $y = 3x + 3$   $-3 = -6 + 3$  **yes**

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

$$7 = 4 + 3$$

$$7 = 7$$
 **yes**

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

$$-2 = -12 + 3$$

$$-2 = -9$$
 **X NO**

**Special Cases:**

1. The graph of  $x = a$  is a **vertical line** that passes through  $(a, 0)$ .
2. The graph of  $y = b$  is a **horizontal line** that passes through  $(0, b)$ .

**Graphing by Plotting Points**

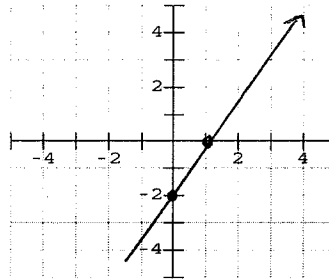
One way to draw the graph of an equation is to make a table of values containing some of the ordered pairs in the solution set and then drawing the graph.

**Exercise 11:** Graphing by plotting points. Sketch a graph of the following equations by making a table of values and plotting the point.

1. Fill in the table of values and graph:

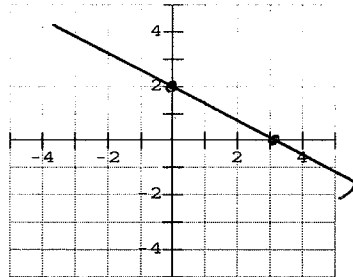
a)  $y = 2x - 2$

$x$	$y$
0	-2
1	0



b)  $2x + 4y = 8$

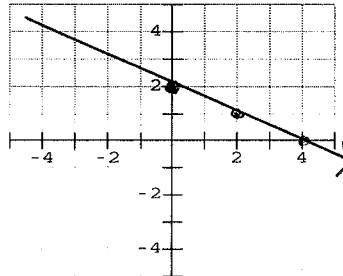
$x$	$y$
0	2
4	0



c)  $y = -\frac{1}{2}x + 2$

Graph making a table of values.

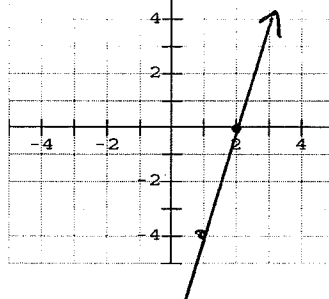
$x$	$y$	$(x, y)$
0	2	(0, 2)
2	1	(2, 1)
4	0	(4, 0)



d)  $4x - y = 8$

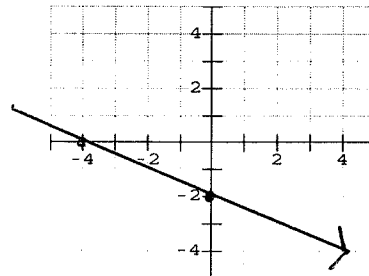
$x$	$y$
0	-8
2	0
1	-4

$-y = -4x + 8$   
 $y = 4x - 8$



e)  $-2x - 4y = 8$

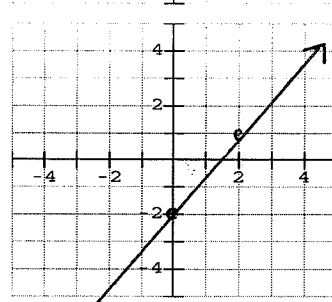
x	y
0	-2
-4	0



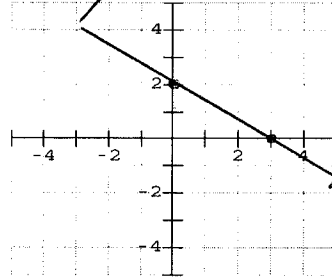
f)  $y = \frac{3}{2}x - 2$

Graph making a table of values.

X	y	X, y
0	-2	(0, -2)
2	1	(2, 1)



g)  $y = -\frac{2}{3}x + 2$



**Definitions:** The **x-intercept** of a line is the point where its graph meets the  $x$ -axis. To find the  $x$ -intercept, set  $y=0$  and solve for  $x$ . The **y-intercept** of a line is the point where its graph meets the  $y$ -axis. To find the  $y$ -intercept, set  $x=0$  and solve for  $y$ .

**Exercise 12:** Finding  $x$ - and  $y$ -intercepts.

- Find the  $x$ - and  $y$ -intercepts of  $2x - 4y = 8$ .
- Find the  $x$ - and  $y$ -intercepts of  $-x + 2y = 5$ .
- Find the  $x$ - and  $y$ -intercepts of  $y = -\frac{1}{2}x + 2$ .

**We will use two basic techniques of graphing:**

- Find the intercepts and graph the line.
- Make a table of values by substituting in several values of  $x$ , plot the points, and then draw the line.

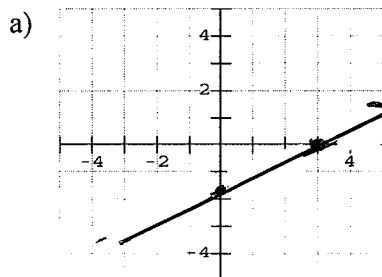
**Exercise 13: Graphing by using intercepts.**

For each of the following, find the  $x$ -intercept and  $y$ -intercept and graph.

a)  $2x - 4y = 6$

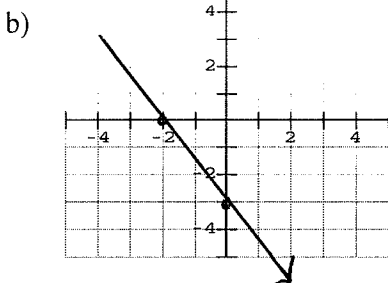
$$\frac{-4y}{-4} = \frac{-2x + 6}{-4} \quad \frac{-4y}{-4} = \frac{-2x + 6}{-4}$$

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



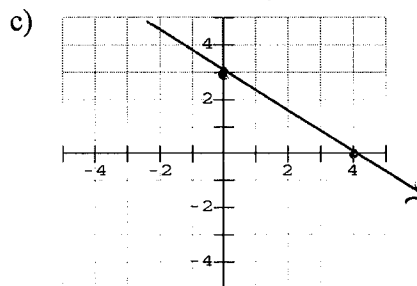
$x$	$y$	$(x, y)$
0	$-\frac{3}{2}$	$(0, -\frac{3}{2})$
3	0	$(3, 0)$

b)  $-3x - 2y = 6$



$x$	$y$	$(x, y)$
0	-3	$(0, -3)$
-2	0	$(-2, 0)$

c)  $3x + 4y = 12$



$x$	$y$	$(x, y)$
0	3	$(0, 3)$
4	0	$(4, 0)$

**Special Cases: Horizontal and Vertical Lines**

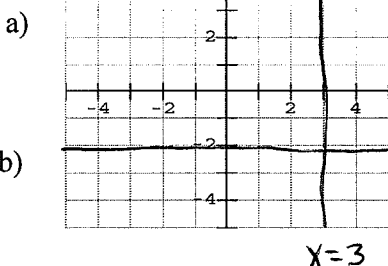
The graph of  $x = a$  is a **vertical line** that passes through  $(a, 0)$ .

The graph of  $y = b$  is a **horizontal line** that passes through  $(0, b)$ .

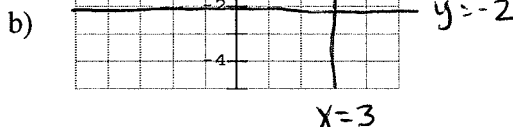
**Exercise 14: Graphing horizontal and vertical lines**

Graph the following lines.

a)  $x = 3$

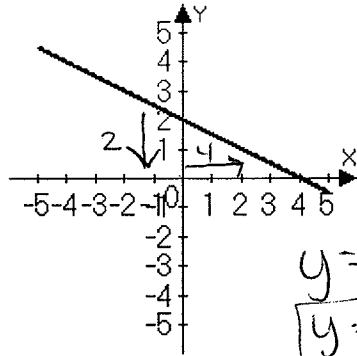
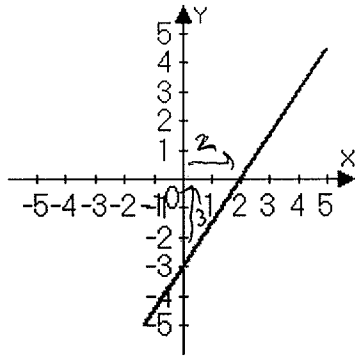


b)  $y = -2$





d) Find the slope-intercept equation for the line whose graph is given.



$$y = \frac{3}{2}x - 3$$

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

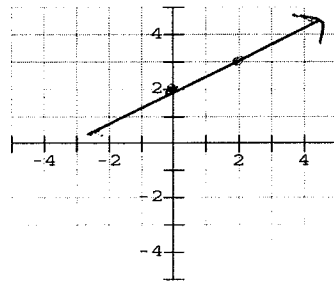
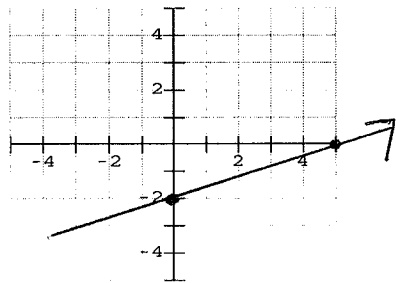
i)

ii)

**Exercise 19:** Graphing using slope and y-intercept.

Graph the line from the given information.

- Graph the line with slope  $\frac{2}{5}$  and y-intercept  $(0, -2)$
- Determine the slope and y-intercept of  $4y - 2x = 8$  and then graph.



$$4y - 2x = 8$$

$$4y = 2x + 8$$

$$\frac{4y}{4} = \frac{2x}{4} + \frac{8}{4}$$

$$y = \frac{1}{2}x + 2$$

**Important Facts:**

- Two lines are **parallel** lines if they have the same slope.
- Two lines are **perpendicular** lines if the product of the slopes is  $-1$ . That is  $m_1 \cdot m_2 = -1$

**Exercise 20:**

- Write an equation for the line that passes through the points  $(2, -5)$  and  $(5, -2)$ .
- Write an equation for the line that passes through the points  $(-3, 4)$  and  $(-2, -2)$ .
- Write an equation for the line that passes through the points  $(-1, 1)$  and  $(-1, 7)$ .
- Write an equation for the line that passes through the points  $(-1, 4)$  and  $(-4, 4)$ .
- Write an equation of the line parallel to the line  $-2x + 4y = 8$  and passing through  $(-1, 1)$ .
- Write an equation of the line perpendicular to the line  $-4x - 6y = 8$  and passing through  $(-1, 1)$ .

f)  $\leftarrow$

$$-6y = 4x + 8$$

$$\frac{-6y}{-6} = \frac{4x}{-6} + \frac{8}{-6}$$

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

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

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

$$y - 4 = -6(x + 3)$$

$$x = -1$$

$$y = 4$$

$$a) m = \frac{-2 - (-5)}{5 - 2} = \frac{3}{3} = 1$$

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

$$b) m = \frac{-2 - 4}{-2 - (-3)} = \frac{-6}{1} = -6$$

$$y - 4 = -6(x + 3)$$

$$c) m = \frac{7 - 1}{-1 - (-1)} = \frac{6}{0} = \text{undefined}$$

slope undefined  
vertical line  
 $x = -1$

$$d) m = \frac{4 - 4}{-4 - (-1)} = \frac{0}{-3} = 0$$

slope zero  
horizontal line

$$e) \frac{4y}{4} = \frac{2x + 8}{4}$$

$$y = \frac{1}{2}x + 2$$

same slope  
 $y - 1 = \frac{1}{2}(x + 1)$

Note: The test also has a few questions from chapter 4 which are not on here!!!