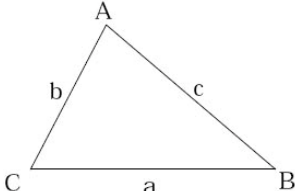
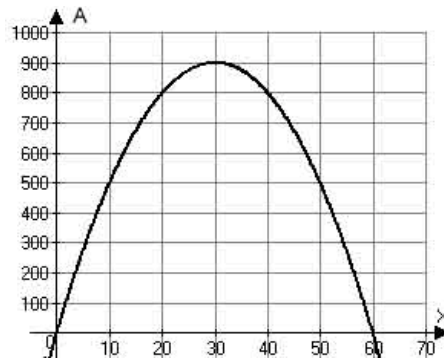


Show your work for credit. Write all responses on separate paper.

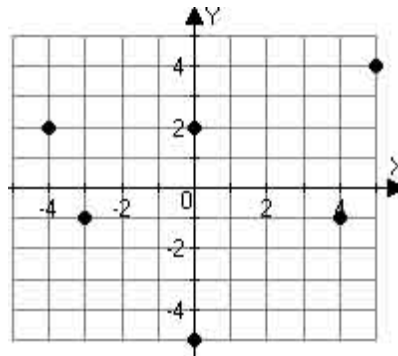
1. Consider the equation  $2(x+5) - 8x + 3 = 2(4x+3) - (x-2)$ .
  - a. Solve the equation.
  - b. State whether the equation is an identity, a contradiction or conditional.
  
2. Consider the equation.  $2p - \frac{p}{6} = \frac{11p}{6} + 2$ 
  - a. Solve the equation.
  - b. State whether the equation is an identity, a contradiction or conditional.
  
3. For what value of  $x$  if  $f(x) = \frac{9x+4}{3x-7}$  not defined (because division by zero is not defined.)
  
4. Solve the linear equation  $\frac{3x+1}{8} - \frac{5x+1}{4} = \frac{1}{6}$ . If the equation is not conditional then identify it as either an identity or a contradiction.
  
5. Introduce a variable and set up an equation involving that variable to find four consecutive odd integers whose sum is 112.
  
6. A college bookstore marks up the price that it pays the publisher for a book by 30%. If the selling price of a book is \$59.00, how much did the bookstore pay for this book? Use a variable and solve an equation involving that variable to answer the question.
  
7. Amber has been saving dimes and quarters which now amount to 34 coins worth a total of \$4.60. Let  $D$  = the number of dimes she has and solve an equation involving  $D$  to determine how many dimes and quarters she has.
  
8. Two bicyclists leave a city at the same time, one going east and the other going west. The west bound cyclist averages a speed which is 3mph faster than the east bound cyclist. After 4 hours they are 180 miles apart. Let  $V$  = the average speed of the slower cyclist. Set up and solve an equation involving  $V$  to determine the average speed of each cyclist.
  
9. The sum of the measure of the interior angles in any triangle is  $180^\circ$ . Suppose the measure of the angle at A is  $34^\circ$  more than the measure of the angle at B and the measure of the angle at C is  $14^\circ$  more than the measure of the angle at B. Find the measures of the interior angles.
 
  
10. Solve the compound inequality,  $-48 \leq -6(x+4) \leq -30$ 
  - a. Express the solution using interval notation.
  - b. Graph the solution interval on the number line.
  
11. Solve the compound inequality,  $\frac{x}{5} \leq 1$  or  $\frac{2x+1}{2} > 7$ 
  - a. Express the solution using interval notation.
  - b. Graph the solution interval on the number line.

12. Solve the absolute value equation,  $|5x + 4| - 2 = 1$
- Express the solution using set notation.
  - Graph the solutions on the number line.
13. Solve the absolute value inequality,  $|x - 2| \leq 4$
- Express the solution using set notation.
  - Graph the solution on the number line.
14. Consider the linear equation in two variables,  $y = -2x + 9$
- Make a table of at least three different  $(x,y)$  solution pairs.
  - Graph the solution in the  $xy$ -rectangular coordinate plane.
15. If  $(a,5)$  is a point on the graph of  $y = 9x - 3$ , what is the value of  $a$ ?

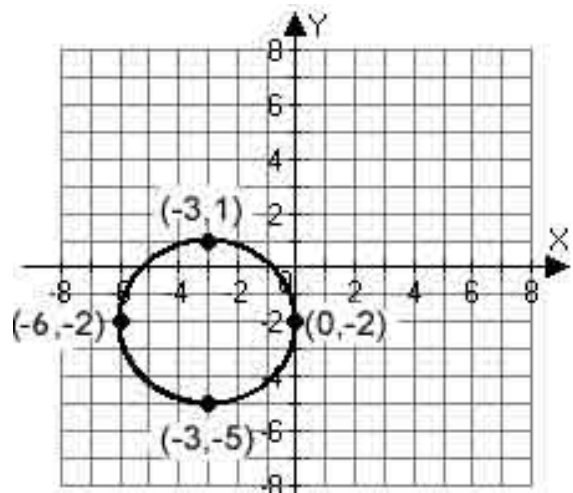
16. Bob wishes to put a new window in his home. He wants the perimeter of the window to be 120 feet. The graph to the right shows the relation between the width,  $x$ , of the opening and the area,  $A$ , of the opening.
- What is the area if the width is 20 feet?
  - What is the width of the opening that produces the maximum area?
  - What is the maximum area?
  - What are the intercepts?



17. Consider the relation whose graph is shown to the right.
- Write the domain of the relation using set notation.
  - Write the range of the relation using set notation.
  - Does this relation represent  $y$  as a function of  $x$ ? Why or why not?



18. Consider the relation whose graph is shown to the right.
- Write the domain in set builder notation.
  - Write the range in set builder notation.



19. Find the value of  $g(-1)$  if  $g(c) = -c^3 - 6c$
20. Tabulate at least 4  $(x,y)$  coordinate solutions to the function  $y = f(x) = |x - 4|$  and sketch a graph. Include the point where  $x = 4$  in your table and some points on either side.

# Math 40 – Intermediate Algebra – Test 1 – Fall '09 – Solutions

1. Consider the equation  $2(x+5) - 8x + 3 = 2(4x+3) - (x-2)$ .

a. Solve the equation.

$$2x + 10 - 8x + 3 = 8x + 6 - x + 2$$

SOLN:  $13 - 6x = 7x + 8$

$$-13x = -5$$

$$x = 5/13$$

b. State whether the equation is an identity, a contradiction or conditional.

SOLN: The equation is true only if  $x = 5/13$ , so it is conditional.

2. Consider the equation.  $2p - \frac{p}{6} = \frac{11p}{6} + 2$

a. Solve the equation.

$$\frac{12p}{6} - \frac{p}{6} = \frac{11p}{6} + \frac{12}{6}$$

SOLN:  $\frac{11p}{6} = \frac{11p+12}{6}$

$$11p = 11p + 12$$

b. State whether the equation is an identity, a contradiction or conditional.

SOLN: Since there is no number 12 bigger than itself, this is a contradiction.

3. For what value of  $x$  if  $f(x) = \frac{9x+4}{3x-7}$  not defined (because division by zero is not defined.)

SOLN: If  $3x - 7 = 0$  then  $f(x)$  is undefined. That is, for  $x = 7/3$ ,  $f\left(\frac{7}{3}\right) = \frac{21+4}{7-7} = \frac{25}{0}$ .

4. Solve the linear equation  $\frac{3x+1}{8} - \frac{5x+1}{4} = \frac{1}{6}$ . If the equation is not conditional then identify it as either an identity or a contradiction. SOLN:

$$\frac{3x+1}{8} - \frac{5x+1}{4} = \frac{1}{6} \Leftrightarrow \frac{9x+3-6(5x+1)}{24} = \frac{4}{24} \Leftrightarrow 9x+3-30x-6=4 \Leftrightarrow -21x-3=4 \Leftrightarrow x = -\frac{1}{3}$$

5. Introduce a variable and set up an equation involving that variable to find four consecutive odd integers whose sum is 112.

SOLN: Let  $x$  = the smallest of the consecutive odd integers so their sum can be equated with 112 like so:  $x + (x + 2) + (x + 4) + (x + 6) = 112$  or, equivalently,  $4x + 12 = 112$  so  $x = 25$  and the integers are 25, 27, 29 and 31.

6. A college bookstore marks up the price that it pays the publisher for a book by 30%. If the selling price of a book is \$59.00, how much did the bookstore pay for this book? Use a variable and solve an equation involving that variable to answer the question.

SOLN: Let  $x$  = the original price. Then 30% more than  $x$  is  $1.3x = 59$  so that  $x = 590/13$ , which is, to the nearest penny) \$45.38 (See the long division at right for the process used to compute this number.)

$$\begin{array}{r} 45.38 \\ 13 \overline{) 590.00} \\ \underline{-52} \phantom{00} \\ 70 \phantom{00} \\ \underline{-65} \phantom{00} \\ 50 \phantom{00} \\ \underline{-39} \phantom{00} \\ 110 \phantom{00} \\ \underline{-104} \phantom{00} \\ 6 \phantom{00} \end{array}$$

7. Amber has been saving dimes and quarters which now amount to 34 coins worth a total of \$4.60. Let  $D$  = the number of dimes she has and solve an equation involving  $D$  to determine how many dimes and quarters she has.

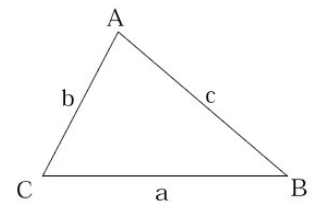
SOLN: Let  $x$  = the number of quarter in the collection. Then  $34 - x$  = the number of dimes and the total value of the collection is  $25x + 10(34 - x) = 460$  whence  $15x = 120$  and  $x = 8$  so she has 8 quarters and 26 dimes.

8. Two bicyclists leave a city at the same time, one going east and the other going west. The west bound cyclist averages a speed which is 3mph faster than the east bound cyclist. After 4 hours they are 180 miles apart. Let  $V$  = the average speed of the slower cyclist. Set up and solve an equation involving  $V$  to determine the average speed of each cyclist.

SOLN: The speed of the west bound cyclist is  $V + 3$  so their relative speed is  $2V + 3$ . After four hours they' ll be  $4(2V + 3) = 180$  miles apart so  $8V = 168$  and  $V = 21$ mph is the average speed of the east bound cyclist and the west bound cyclist is averaging 24mph.

9. The sum of the measure of the interior angles in any triangle is  $180^\circ$ . Suppose the measure of the angle at A is  $34^\circ$  more than the measure of the angle at B and the measure of the angle at C is  $14^\circ$  more than the measure of the angle at B. Find the measures of the interior angles.

SOLN:  $(B + 34) + B + (B + 14) = 180$  so  $3B = 132$  whence  $B = 44^\circ$ ,  $A = 78^\circ$  and  $C = 58^\circ$



10. Solve the compound inequality,  $-48 \leq -6(x + 4) \leq -30$

- a. Express the solution using interval notation.

$$-48 \leq -6x - 24 \leq -30$$

$$\text{SOLN: } -24 \leq -6x \leq -6$$

$$4 \geq x \geq 1$$

$$1 \leq x \leq 4$$

So the solution is  $x \in [1, 4]$

- b. Graph the solution interval on the number line.



11. Solve the compound inequality,  $\frac{x}{5} \leq 1$  or  $\frac{2x+1}{2} > 7$

- a. Express the solution using interval notation.

$$\frac{x}{5} \leq 1 \text{ or } \frac{2x+1}{2} > 7 \Leftrightarrow x \leq 5 \text{ or } x > \frac{13}{2} \text{ which, in interval notation is } x \in (-\infty, 5] \cup \left(\frac{13}{2}, \infty\right).$$

- b. Graph the solution interval on the number line.



12. Solve the absolute value equation,  $|5x + 4| - 2 = 1$

- a. Express the solution using set notation.

$$\text{SOLN: } |5x + 4| = 3 \Leftrightarrow 5x + 4 = 3 \text{ or } 5x + 4 = -3 \Leftrightarrow x = -\frac{1}{5} \text{ or } x = -\frac{7}{5} \Leftrightarrow x \in \left\{-\frac{1}{5}, -\frac{7}{5}\right\}$$

- b. Graph the solutions on the number line.



13. Solve the absolute value inequality,  $|x - 2| \leq 4$

a. Express the solution using set notation.

SOLN:  $-4 \leq x - 2 \leq 4 \Leftrightarrow -2 \leq x \leq 6 \Leftrightarrow x \in [-2, 6] = \{x \mid -2 \leq x \leq 6\}$

b. Graph the solution on the number line.

SOLN:



14. Consider the linear equation in two variables,  $y = -2x + 9$

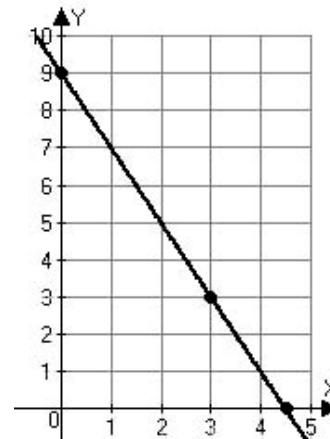
a. Make a table of at least three different  $(x, y)$  solution pairs.

SOLN:

$x$	0	3	4.5
$y$	9	3	0

b. Graph the solution in the  $xy$ -rectangular coordinate plane.

SOLN: (Shown at right)



15. If  $(a, 5)$  is a point on the graph of  $y = 9x - 3$ , what is the value of  $a$ ?

SOLN: Substituting  $x = a$  and  $y = 5$  we have  $5 = 9a - 3$  or, equivalently  $a = 8/9$ .

16. Bob wishes to put a new window in his home. He wants the perimeter of the window to be 120 feet. The graph to the right shows the relation between the width,  $x$ , of the opening and the area,  $A$ , of the opening.

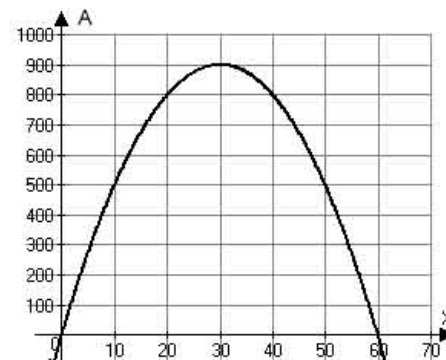
a. What is the area if the width is 20 feet?

SOLN: 800 square feet

b. What is the width of the opening that produces the maximum area? SOLN: 30 ft.

c. What is the maximum area? SOLN: 900 square ft.

d. What are the intercepts?  $(0, 0)$  and  $(60, 0)$



17. Consider the relation whose graph is shown to the right.

a. Write the domain of the relation using set notation.

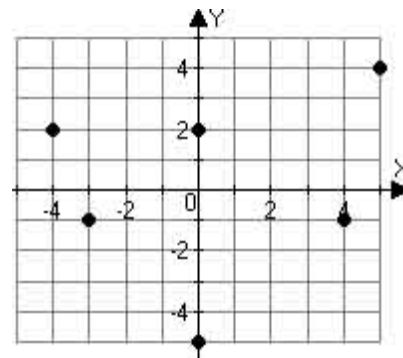
SOLN: Domain =  $\{-4, -3, 0, 4, 5\}$

b. Write the range of the relation using set notation.

SOLN: Range =  $\{-5, -1, 2, 4\}$

c. Does this relation represent  $y$  as a function of  $x$ ? Why or why not?

SOLN: No, since  $(0, 2)$  and  $(0, -5)$  are both elements.



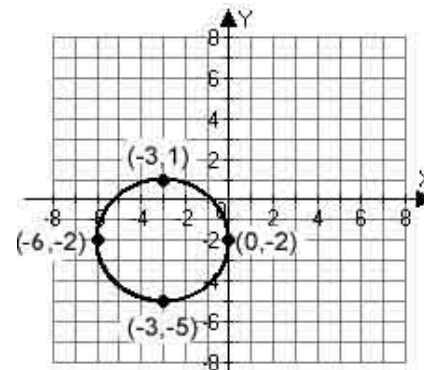
18. Consider the relation whose graph is shown to the right.

a. Write the domain in set builder notation.

SOLN: Domain =  $\{x \mid -6 \leq x \leq 0\}$

b. Write the range in set builder notation.

SOLN: Range =  $\{y \mid -5 \leq y \leq 1\}$



19. Find the value of  $g(-1)$  if  $g(c) = -c^3 - 6c$

SOLN:  $g(-1) = -(-1)^3 - 6(-1) = -(-1) + 6 = 7$

20. Tabulate at least 4  $(x,y)$  coordinate solutions to the function  $y = f(x) = |x - 4|$  and sketch a graph. Include the point where  $x = 4$  in your table and some points on either side.

$x$	0	2	4	6
$f(x)$	4	2	0	2

