

**Math 1210 – College Algebra I**  
EXAM THREE: Sections 1.5, 2.1, 2.2, 2.3 and 2.4  
Tuesday, March 29, 2011

Name: \_\_\_\_\_

Instructor: \_\_\_\_\_ ClassTime \_\_\_\_\_

- If your instructor is not standing in the room you are in the wrong room. Talk to an instructor and they will direct you to the correct room.
- Make sure all cell phones, ipods, mp3 players and other electronic devices are turned off and put away. The only items that should be on your desk are your calculator, test paper and writing implement.
- Turn your hat around.
- Put your closed book bag and calculator cover under your seat.
- Once you have started the exam you may not leave the room until you are finished with your exam and have turned it in.
- We cannot answer questions about how to do a problem or using the calculator. We will answer questions that are for clarification of what is being asked or strange error messages on the calculator.
- You should have 4 different pieces of paper. The first 3 printed on the front and back. The last page printed only on the front. If you need extra room for a problem, use the back of the last page.
- When you are finished, make sure you turn your test into YOUR instructor and you are free to leave.
- **Show all work** to receive credit for each of the problems. A problem worth more than 2 points with the correct answer and no work, will receive **NO CREDIT**.
- Incorrect answers with incorrect work shown or no work shown will **NOT** receive any credit.
- **Circle your answers** and include units on answers when appropriate.
- Give answers to written questions in **complete sentences**.
- Answers that are inequalities can be given in any notation.

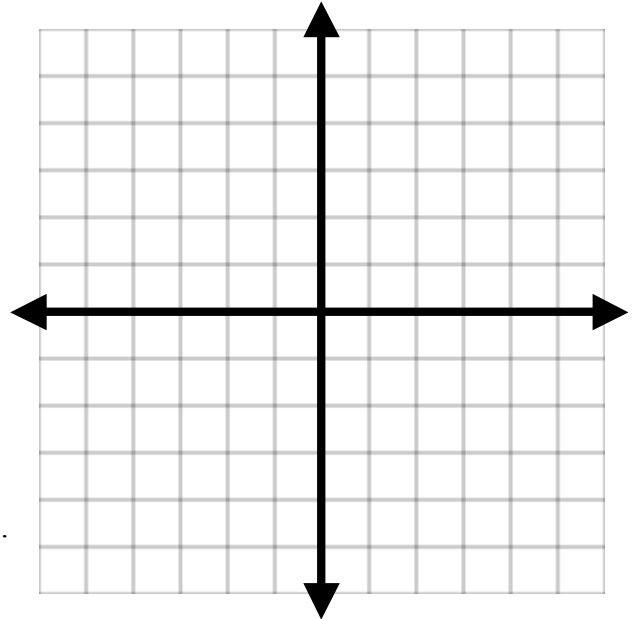
1. (2 pts each) For each statement below fill in the blank with the correct answer.

a. The  $x$ -intercept of the line  $2x + 7y = 28$  is \_\_\_\_\_.

b. The  $y$ -intercept of the line  $2x + 7y = 28$  is \_\_\_\_\_.

c. The equation of the vertical line that passes through the point  $(4, 6)$  is \_\_\_\_\_.

2. (2 pts) Sketch the graph of a function that has only negative average rates of change for  $x \leq -2$  and only positive average rates of change for  $x \geq -2$ . Use the grid at the right.



3. (2 pts each) For each statement below circle T if the statement is true and F if the statement is false.

T      F      If a function is always increasing then it only has positive average rates of change.

T      F      The average rate of change between any two points of a nonlinear function is constant.

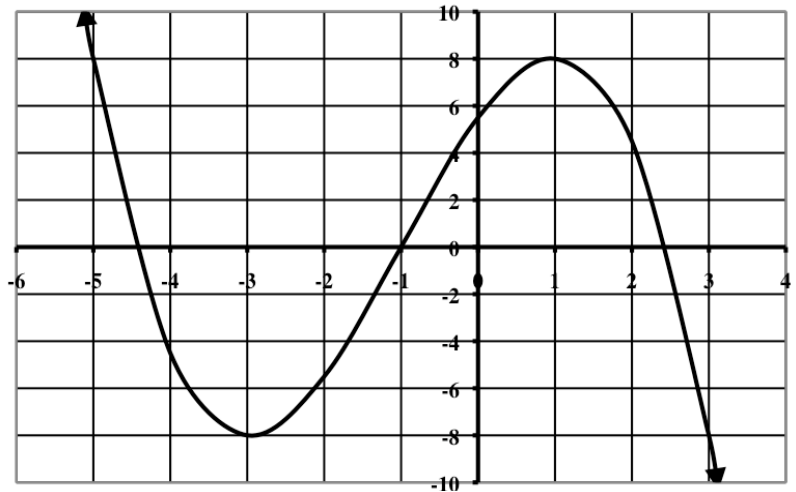
4. For parts a – c, let  $f(x) = 2x^2 - 6x - 15$ .

a. (4 pts) Find the average rate of change of  $f(x)$  from  $x_1 = -2$  to  $x_2 = 0$ .

b. (2 pts) Determine where the graph of  $f(x)$  is increasing. Write your answer in interval notation.

c. (2 pts) Determine where the graph of  $f(x)$  is decreasing. Write your answer in interval notation.

5. (2 pts each) From the list below, indicate the interval(s) where the function is increasing and the interval(s) where the function is decreasing. **You may have more than one answer.**



Decreasing \_\_\_\_\_

Increasing \_\_\_\_\_

- |                  |                 |                      |                    |                    |
|------------------|-----------------|----------------------|--------------------|--------------------|
| A. $[1, \infty)$ | B. $[-4.5, -1)$ |                      |                    |                    |
| C. $[-3, 1]$     | D. $[-6, 4]$    | E. $(-\infty, -4.5]$ | F. $[-8, 8]$       | G. $(-\infty, -3]$ |
| H. $[-1, 2.5]$   | I. $[-1, 2.5]$  | J. $[2.5, \infty)$   | K. $(-\infty, -8]$ | L. $[8, \infty)$   |

6. (2 pts) The equation  $5x - 3(x + 2) = 2x - 4$  can be classified as: (Choose the best answer.)
- A) a conditional equation      B) an identity      C) a contradiction

7. (4 pts) Solve the following equation for  $x$ .
- $$y = 3(x - 5) + 2$$

8. (4 pts each) Solve the linear equations symbolically. Give an exact answer.

a. $5 - 2x - 7(4 - x) = 2(x + 3)$	b. $\frac{1}{3}(x - 4) + \frac{5}{3} = \frac{2}{5}x$
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9. (4 pts each) Solve the following inequalities symbolically for  $x$ . Give an exact answer.

a.  $\frac{4 - 5x}{-6} > 2x$

b.  $-9 \leq 4x - 9 \leq 8$

10. The required cooling capacity, in BTUs, for a room air conditioner is directly proportional to the area of the room being cooled. A room of 270 square feet requires an air conditioner whose cooling capacity is 9000 BTUs.

a. (3 pts) What is the constant of proportionality? Give an exact answer.

b. (3 pts) If a room is 15 feet by 14 feet (210 square feet) what size, in BTUs, room air conditioner should you buy?

11. Answer the following questions using the graph of the linear function  $f(x)$  shown at the right.

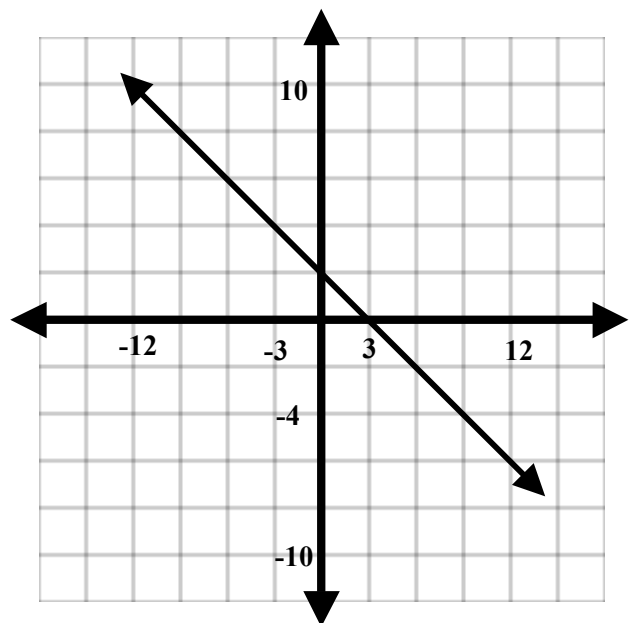
a. (1 pt) Identify the  $y$ -intercept.

b. (1 pt) Identify the  $x$ -intercept.

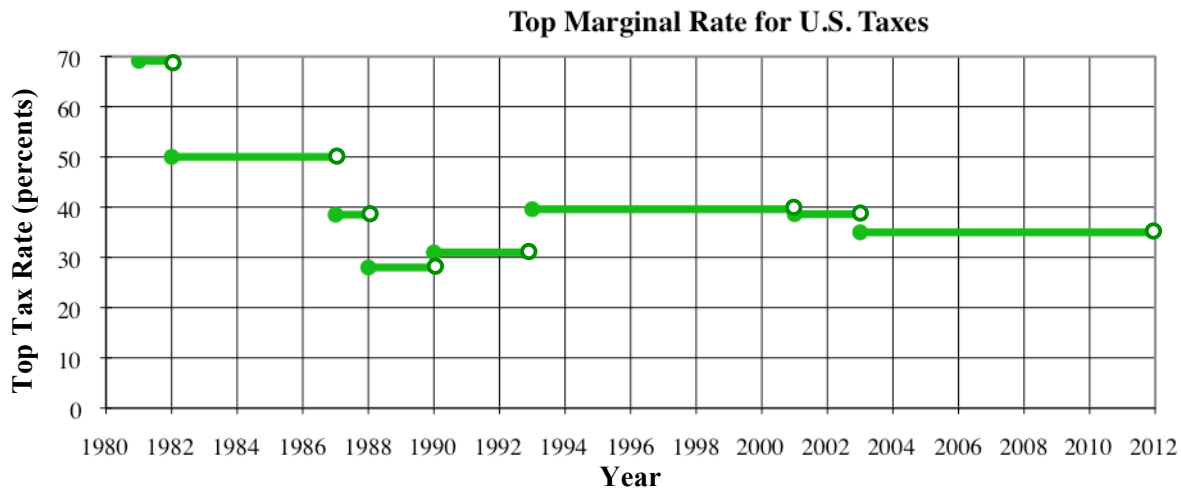
c. (2 pts) Identify the slope.

d. (2 pts) Write a formula for  $f$ .

e. (1 pt) Find any zeros of  $f$ .



12. The graph below shows the top tax rate for U.S. income tax from 1981 until 2011.  
<http://www.taxpolicycenter.org/taxfacts/displayafact.cfm?Docid=213>



- a. (2 pts) What year did the top tax rate decrease by the largest amount?
- b. (2 pts) In part b, how much was this decrease in the top tax rate?
- c. (2 pts) What was the top tax rate in 1993?
13. In 1990 the federal minimum wage was \$3.80. By 2010 the minimum wage had increased to \$7.25.  
 (Source: <http://www.laborlawcenter.com/t-federal-minimum-wage.aspx>)
- a. (2 pts) Find the slope of the line that passes through the points  $(1990, 3.80)$  and  $(2010, 7.25)$ . Show work to get full credit for this problem.
- b. (2 pts) Interpret the slope in part a in context of the problem.
- c. (2 pts) Assuming the minimum wage increased at a constant rate, find an equation of a line that models this data, where  $x$  is the year.

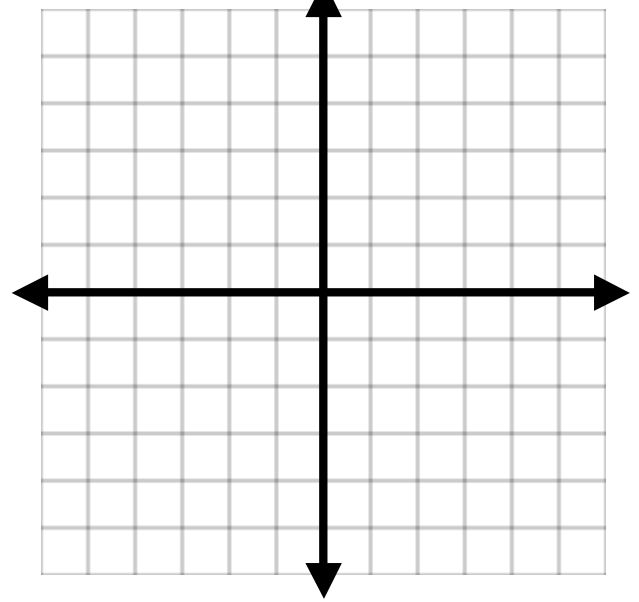
14. Let  $f(x) = \begin{cases} -\frac{1}{2}x - 1 & \text{if } -6 \leq x \leq -2 \\ 5 & \text{if } -2 < x \leq 5 \end{cases}$

- a. (2 pts) Determine the domain of  $f$ .
- b. (2 pts each) Evaluate each of the following.

$$f(-2) =$$

$$f(-1) =$$

- c. (4 pts) Graph  $f$  on the grid on the right.



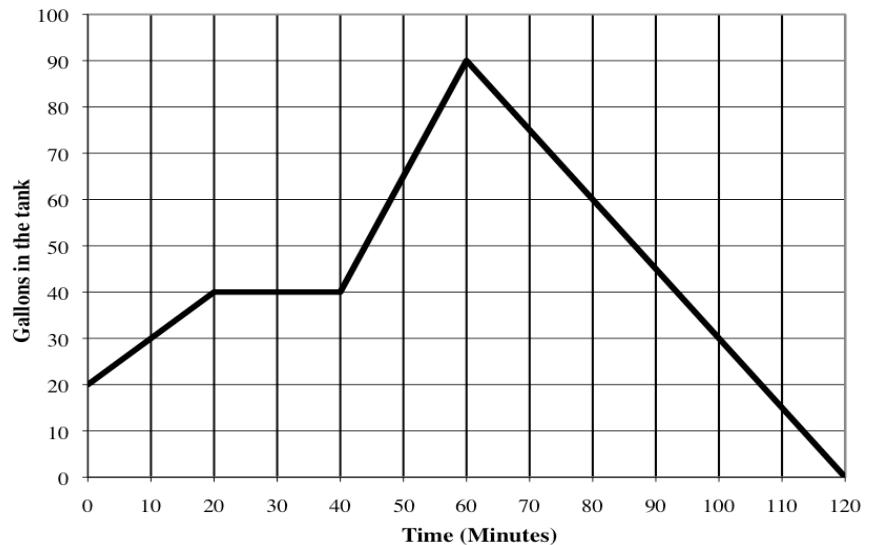
15. The table below shows the percentage of the total federal personal income tax paid by U.S. adult citizens that are in the bottom 50% of income earned. In 2008 this included all adults that made less than \$33,048. (Source: <http://www.ntu.org/tax-basics/who-pays-income-taxes.html>)

Year	1999	2000	2002	2004	2005	2007	2008
Percentage of Federal Personal Income Tax Paid	4	3.91	3.5	3.3	3.07	2.89	2.7

- a. (2 pts) Use your calculator to make a scatterplot of the data. Choose the best answer that describes the data. You do not have to show your scatterplot.
- A) The data is approximately linear.                      B) The data is exactly linear.
- C) The data does not resemble a linear function.
- b. (2 pts) Find the least-squares regression line that models the data. Round values to 4 decimal place.
- c. (2 pts) Estimate the percent of personal income tax that will be paid by the bottom 50% of wage earners in 2011.
- d. (2 pts) Did your calculation in part c involve interpolation or extrapolation? Explain your answer.

16. (3 pts) Write the formula for a linear function  $f$  whose graph has a slope  $-3$  and passes through  $(-2,5)$ . Give answer in slope intercept form.

17. The graph at the right shows the amount of liquid in a tank after  $x$  minutes.



- a. (2 pts) Over what time interval(s) was the water level constant?
- b. (2 pts) Over what time interval was the tank filling the fastest? Explain your answer.
- c. (2 pts) What was the rate at which the tank was filled between 0 minutes and 20 minutes? Make sure to include units on your answer.
- d. (2 pts) State the  $y$ -intercept and interpret it in context of the question.
- e. (2 pts) Is the graph continuous on its domain? Explain your answer.