

# Final Examination

# Fall 2007 CI/Math 322

Do not write here. For Graders' Use Only		
Problem	Possible	Earned
1	12	
2	6	
3	5	
4	5	
5	5	
6	8	
7	16	
8	14	
9	9	
10	6	
11	10	
12	8	
13	12	
14	10	
15	8	
16	12	
17	8	
18	12	
19	10	
20	5	
21	5	
22	10	
23	4	
<b>TOTAL</b>	<b>200</b>	

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

ID Number: \_\_\_\_\_

Class Time: \_\_\_\_\_

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

Please check to make sure that your copy of the examination has all 17 pages and all problems numbered 1 through 23.

Show all work.

Scientific calculators are permitted. Graphing calculators, programmable calculators and cell phones are NOT permitted.

Name \_\_\_\_\_

ID \_\_\_\_\_

1. Compute the answer. Show all your work.

a) (4 points)  $2 + 3 - 6 \times 2 + 6 \times 3 = ?$

b) (4 points)  $3 \times 4 - 3 + 15 \div 5 + 4 = ?$

c) (4 points)  $(5 \times 8) \div [20 \div 2] + 10 = ?$

2. (2 points each)

a. Express  $4^3 \times 4^7$  using a single exponent.

b. Express  $2^5 \times 3^5$  using a single exponent.

c. Express  $(3^2)^4$  using a single exponent.

3. (5 points) A student gave the answer “2” for the problem  $12 \div 2 \times 3$ . Is this correct? Explain.

4. (5 points) Use a visual representation to explain WHY it is true that

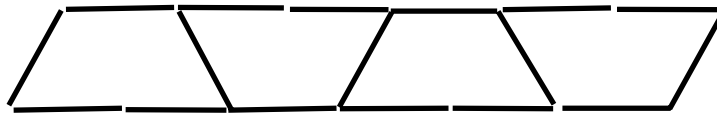
$$3(4+5) = 3 \times 4 + 3 \times 5$$

5. (5 points) Make a visual representation to explain why it is true that  $5 \div \frac{2}{3} = 7 \frac{1}{2}$

6. (8 points) Here is an incomplete table with missing values. Determine the missing values. Justify your answer.

$x$	$y$
2	—
3	—
4	13
5	16
6	19
7	—
8	25

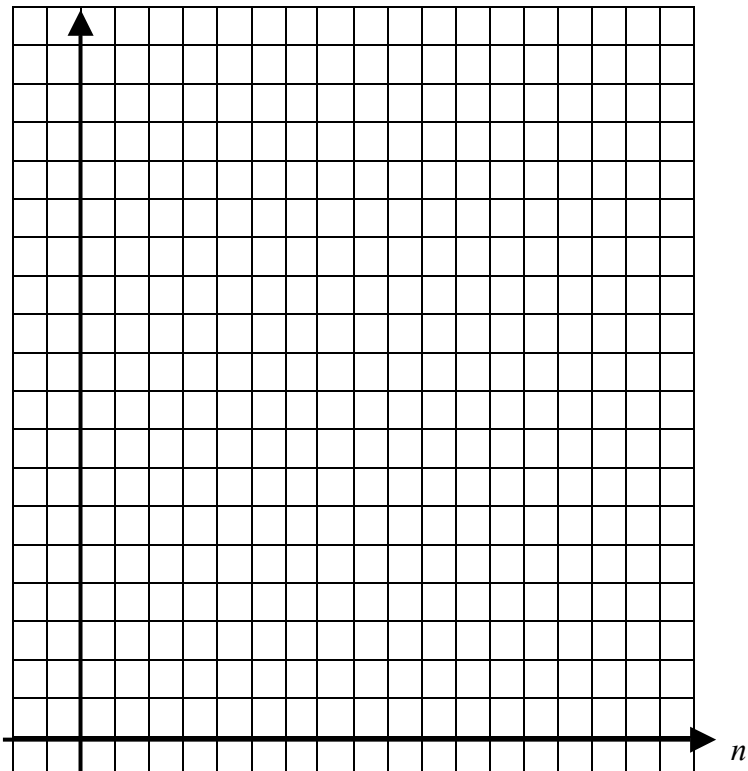
7. Toothpicks are used to create an array of trapezoids like the one below. The long edge of each trapezoid is made with two toothpicks. The other edges are made with one toothpick each.



- a) (8 points) Complete the following table showing the number  $T$  of toothpicks used when  $n$  trapezoids are formed in the above array AND the perimeter  $P$  of the figure formed by  $n$  trapezoids.

$n = \#$ trapezoids	$T = \#$ toothpicks	$P =$ perimeter
1		
2		
3		
4		
5		
25		

- b) (4 points) Write an equation for the number of toothpicks used when  $n$  trapezoids are formed in the above array.



- c) (4 points) Make a graphical representation of the number of toothpicks used and the perimeter of the figure formed when  $n$  trapezoids are placed as above. Clearly indicate which is which.

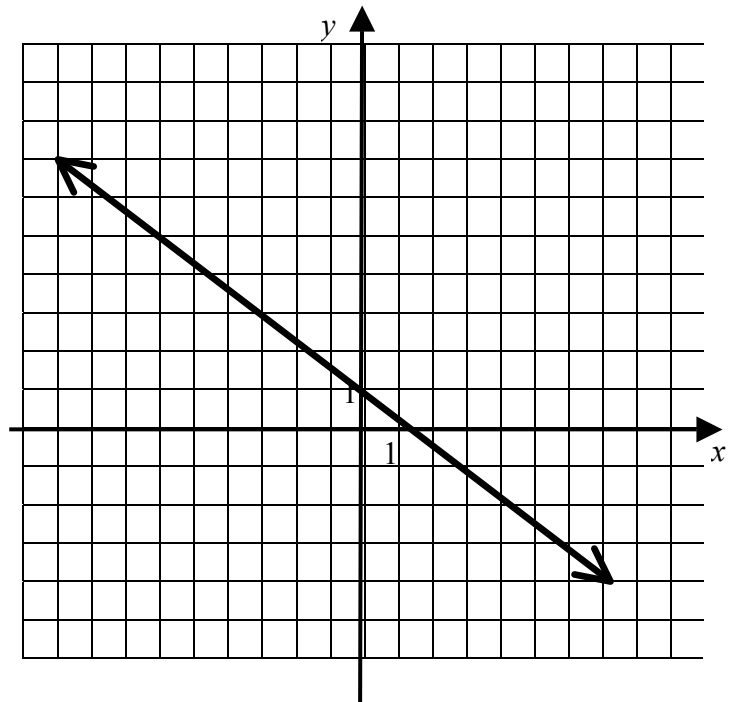
8. Examine the graph of the straight line below.

- a. (4 points) Find the slope of this line. Explain.

Slope = \_\_\_\_\_

- b. (4 points) Find the y-intercept of this line. Explain.

y-intercept = \_\_\_\_\_

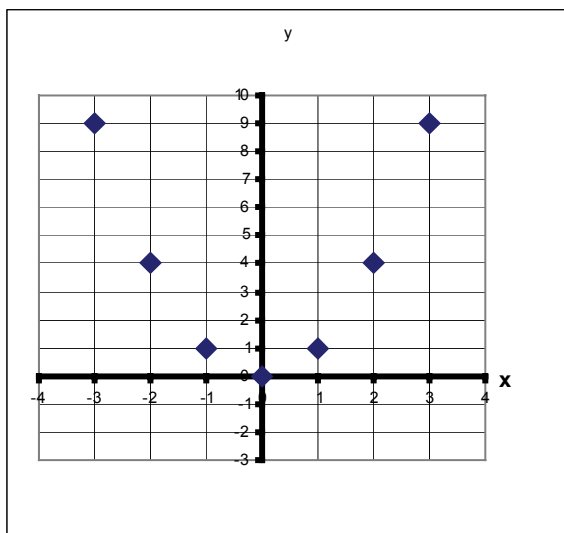


- c. (2 points) Write the equation of this line:

- d. (4 points) Use the equation to determine the exact value of  $x$  when  $y = 0$ .

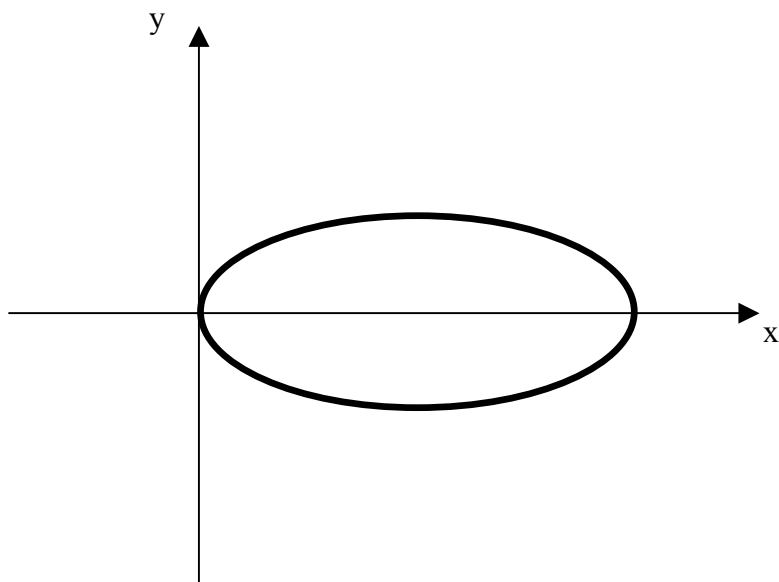
9. (9 points) For each of parts (a), (b) and (c), a relation is represented either graphically or in set notation. In each case, determine whether the relation is a function. Explain.

a)  $\{(-1, 8), (1, 12), (2, 14), (5, 20), (1, 21)\}$



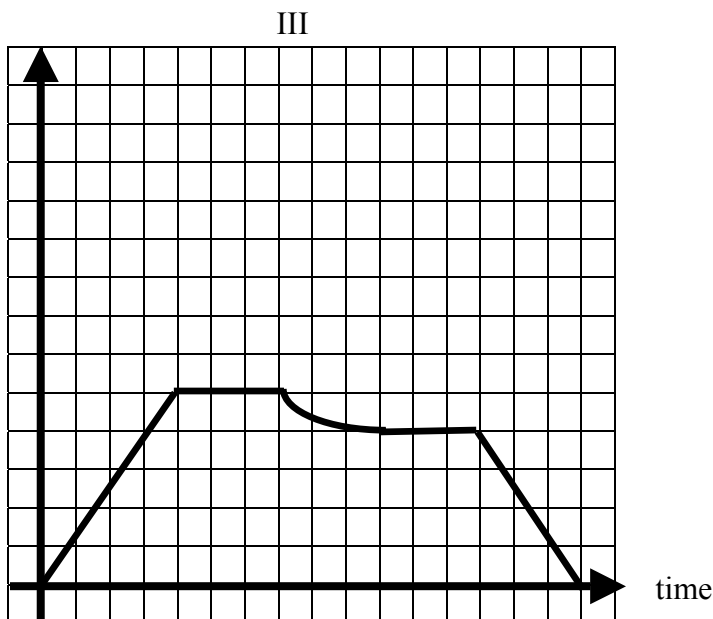
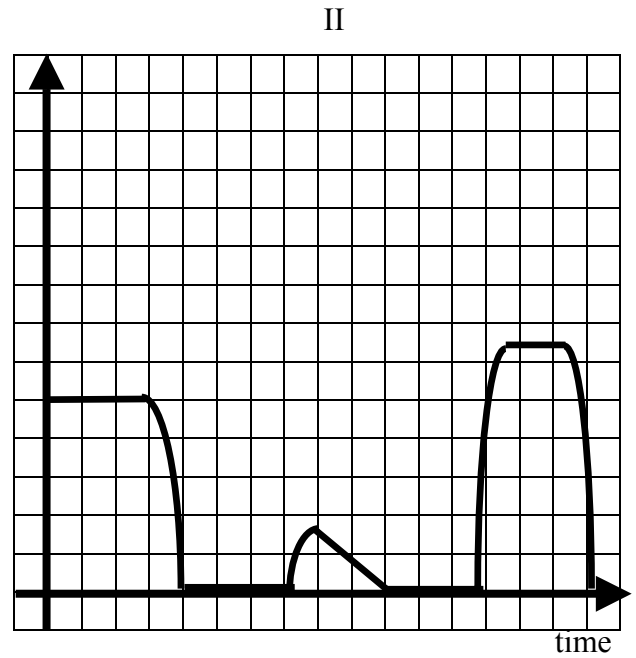
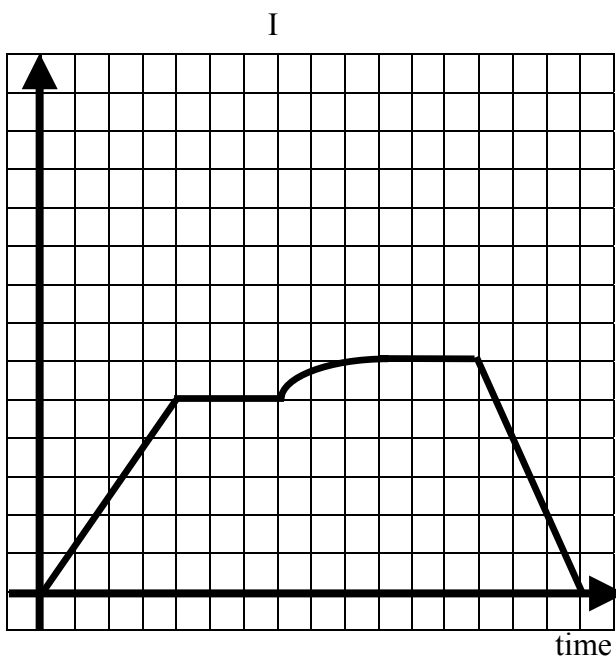
b)

c)



10. (6 points) Tommy left his house and walked at a steady pace all the way to his friend's house. He stayed there a while. Then he left and climbed the steep hill on his way back home. He got tired and had to slow down toward the top of the hill. When he reached the top, he stopped to catch his breath and then walked briskly the rest of the way back to his house.
- (a) Select the graph that represents Tommy's distance from home. Explain.

- (b) Select the graph that represents Tommy's speed. Explain.



11. Neatly sketch an Algebra Tile representation of the solution of each problem:

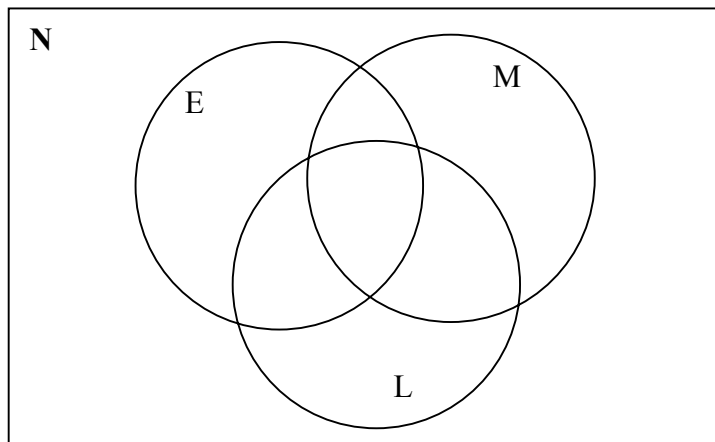
(a) (5 points)  $(x + 2)(2x + 3) = \underline{\hspace{2cm}}$

(b) (5 points)  $(\underline{\hspace{1cm}})(\underline{\hspace{1cm}}) = 2x^2 + 7x - 4$

12. (8 points) Explain as if you were teaching this to your class: What is the FOIL property and how does it help us to answer a question such as  $(3x - 5)(2x + 3) = ?$  Show all your work.

13. For this problem, consider the set  $\mathbf{N}$  of Natural Numbers. Let  $E$  denote the set of even natural numbers, let  $M$  denote the set of natural number multiples of 5 and let  $L$  denote the set of natural numbers less than 20.

a) (8 points) Within each region of the Venn diagram below, write an example of a number that belongs there.



b) (2 points) Give a verbal description of the numbers that belong to  $E \cap M$ .

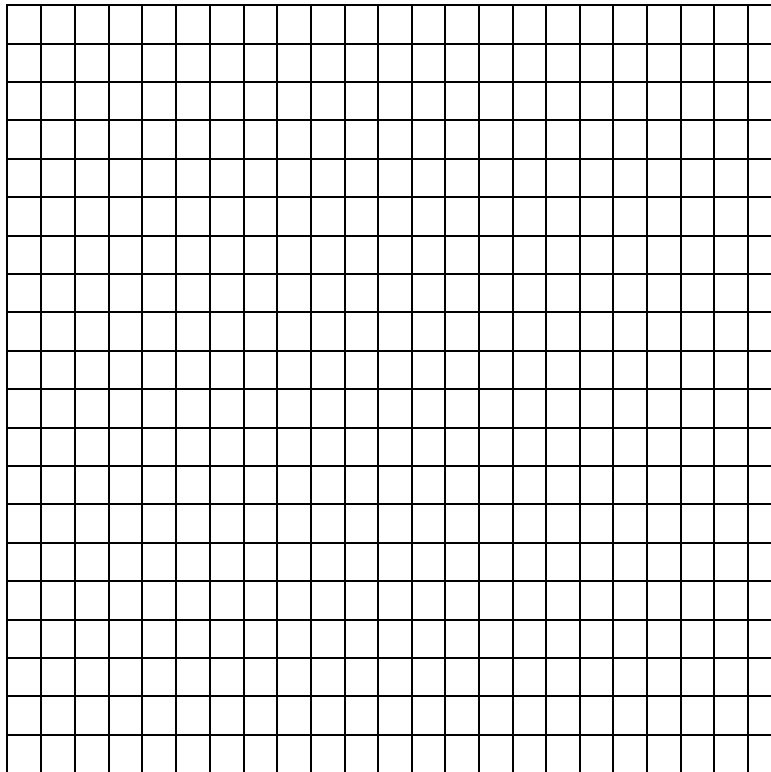
c) (2 points) Give a verbal description of the numbers that belong to the *complement* of  $L$ .

14. (10 points) Consider the system of equations

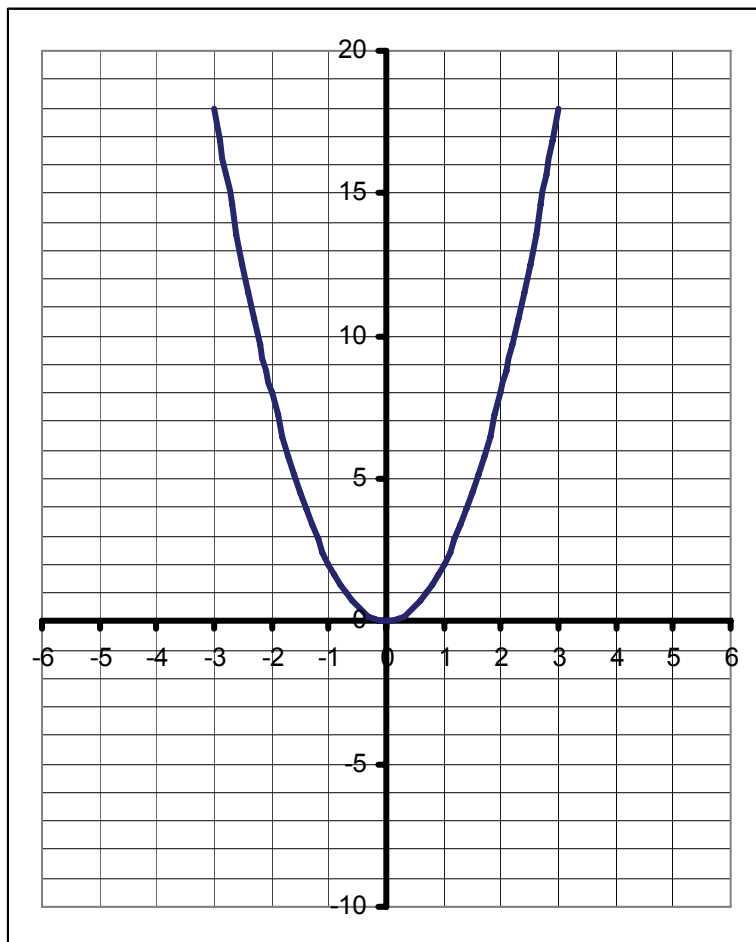
$$\begin{cases} 3x + 2y = 12 \\ 2x - y = 1 \end{cases}$$

a) Solve the system using algebraic techniques. Show all your work.

b) Solve the system by graphical methods.



15. (8 points) The graph of  $y = 2x^2$  is shown below.



a) On the same coordinate system (above), show the graph of  $y = 2x^2 - 3$

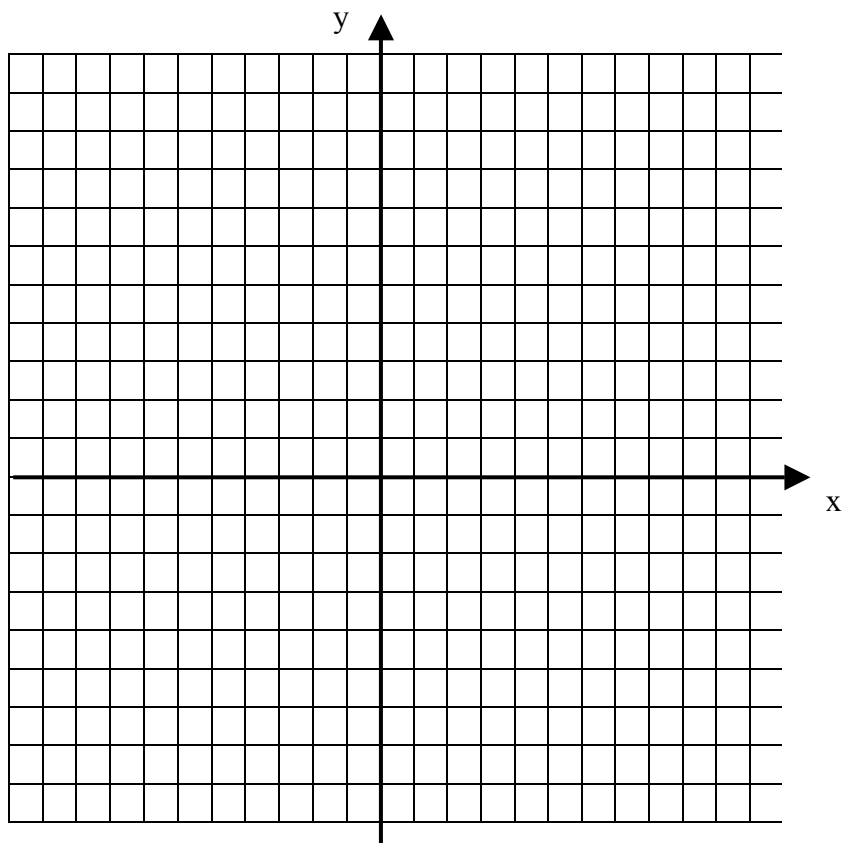
b) On the same coordinate system (above), show the graph of  $y = 2(x+2)^2$ .

Clearly indicate which graph is which!

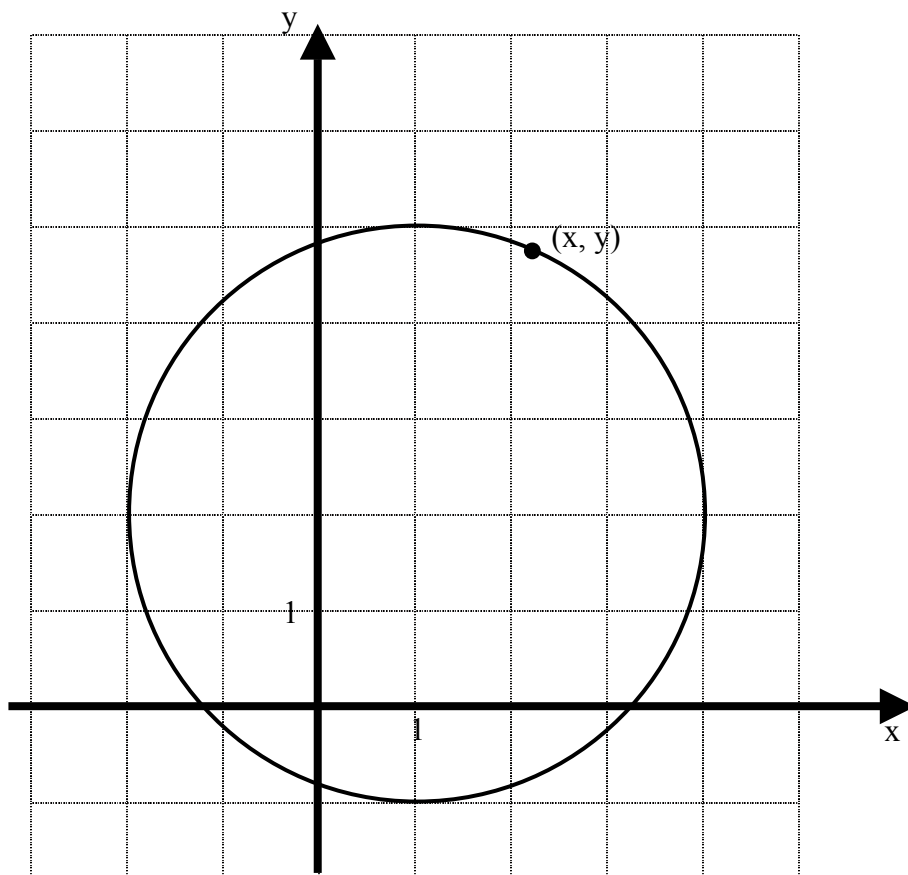
16. (12 points) Use colored shading to represent the following on the same coordinate system (below)

- a)  $y < 3x - 2$
- b)  $y = 3x - 2$
- c)  $y > 3x - 2$

Clearly indicate which shading represents which equation/inequality.



17. Consider the circle sketched below.



a) (2 points) Give the coordinates of the center of the circle.

b) (2 points) Find the radius of the circle.

c) (4 points) Find the equation of the circle. Explain!

18. (12 points) Consider two input-output machines. One machine is an “Add 2” machine – it adds two to the input. The other machine is a “Times 3” machine – it multiplies the input by 3.
- If the machines are lined up so that the output tray from the “Add 2” machine feeds into the input tray for the “Times 3” machine, what happens when “5” is fed into the input tray of the “Add 2” machine?
  - Is the result the same if the “Times 3” machine is placed first, with its output tray feeding into the input tray of the “Add 2” machine? Explain.
  - Still assuming the “Times 3” machine is placed first, with its output tray feeding into the input tray of the “Add 2” machine, what input must go into the “Times 3” machine to get a final result of “26” after going through both machines? Explain.

19. (10 points) Use a Singapore-style strip diagram to solve the following:

- a) Mr. Wilson bought some eggs. He used  $\frac{1}{2}$  of the eggs to make tarts and  $\frac{1}{4}$  of the remaining eggs to make a cake. He had 9 eggs left. How many did he buy?

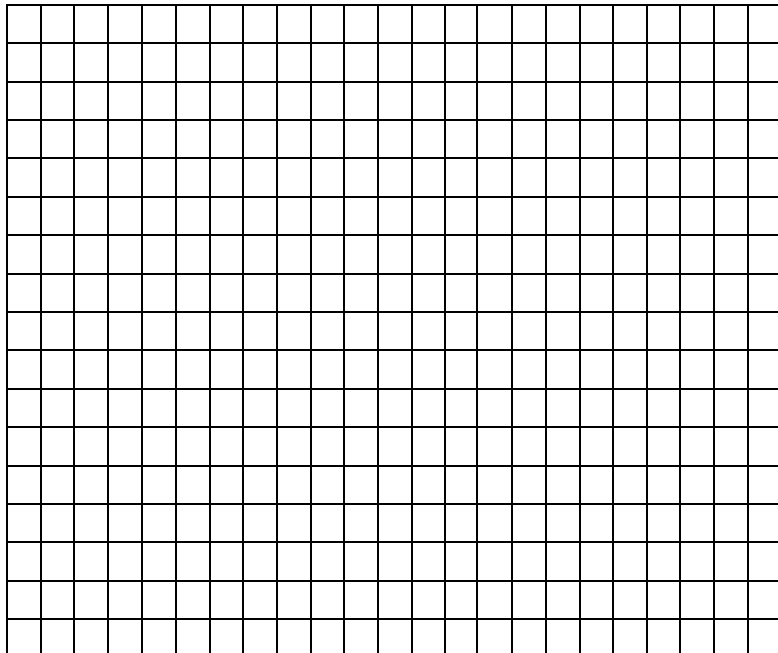
- b) In a certain group, the ratio of the number of boys to the number of girls is 2:5. If there are 100 girls, how many children are there altogether in the group?

20. (5 points) On the playground on a bright, sunny day, Dennis notices that his shadow is exactly 3 feet long. Dennis is 4 feet tall. When Dennis and his friends measure the shadow of the school flagpole, they find that the shadow is 12 feet long. How tall is the flagpole? Explain.

21. (5 points) After a long freeze on its rates, the local utility company announces that rates will increase 20% each year for the next 3 years. If your monthly utility bill is now \$100, what will it be after the proposed increases? Explain.

22. a) (5 points) Iodine-131 is a radioactive form of iodine with a half-life of 8 days. It may be used to treat hyperthyroidism in humans and animals. If an initial dose of “1 unit” of radioactive iodine is administered, what percent (or what fraction) of that radioactive amount remains after 32 days? Show your work.

b) (5 points) Make a graph showing the percentage (or fraction) of Iodine-131 left after  $t$  days.



23. (4 points) Which of the following is the graph of  $(x+1)^2 + (y-2)^2 = 16$ ? Assume the squares are unit squares.

