MAT 112 Final Exam Fall 2007

December 12, 2007

Instructions:

Do not open this booklet until you are told to do so. Show all work required to solve the problems. Incorrect answers not supported by work will receive no partial credit. You may use a calculator on any part of the exam, but you may not share a calculator with another student. If you have any questions, ask one of the proctors.

Printed name: ________________________________

Signature: _________________________________

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PART I

1. a. (3 pts) State the commutative property and illustrate with an example.

b. (3 pts) Simplify the following expression (show all your work):
\[-7x + 8(x - 2y) + 6y\]

c. (4 pts) Simplify (show your work):
\[3(2 - 5) + \frac{(6^2 - 3^3)}{2^4 - 13(11 - 10)}\]

2. Consider the table to the right:

\[
\begin{array}{c|c}
  x & y = f(x) \\
  \hline
  0 & 10 \\
  2 & 6 \\
  4 & 2 \\
  6 & -2 \\
  8 & -6 \\
\end{array}
\]

a. (2 pts) Is this function linear?

b. (2 pts) What is the value \(f(6)\)?

c. (2 pts) For what values of \(x\) is \(f(x) < 2\)?

d. (4 pts) Find an equation of this function?
3. Write an equation of the line with the given characteristics:

a. (4 pts) Passes through the points (-2, 11) and (3, -9)

b. (4 pts) Passes through the point (3, -1) and parallel to \( y = 0.5x - 11 \)

c. (2 pts) What is the slope and y-intercept of the following equation: \( y = -3x + 7 \)

4. Suppose Alice made $60 more than five times what Kim earned in one month. If together they earned $558, how much did each of them earn?

a. (2 pts) Identify and assign symbols to the variables in the problem.

b. (2 pts) Write a symbolic rule relating the variables.

c. (2 pts) What are the domain and range of the function in the context of the problem?

d. (4 pts) Solve the problem and tell how much each earned.
Part II

5. Solve for x.
   a. (2 pts)  
   
   \[ -3x + 11 = 2x - 9 \]
   
   b. (2 pts)  
   
   \[ 10 - 13x < 49 \]
   
   c. (3 pts)  
   
   \[ |2 - 7x| = 14 \]
   
   d. (3 pts)  
   
   \[ -(9 - 4x) \geq 0 \]

6. Consider the following quadratic equation:  
   \[ f(x) = x^2 - 6x - 16 \]
   
   a. (3 pts) Write the equation in the form  
   \[ y = a(x - h)^2 + k \] (Hint: complete the square)

   b. (2 pts) Write the equation in factored form.

   c. (2 pts) Find the zeroes of the equation.

   d. (3 pts) Graph the function (be sure to label the scale of the axes).
7. Consider the following equation: \[ g(x) = 2|x - 4| + 5 \]

a. (2 pts) What is the vertex of the graph?

b. (2 pts) What is the slope of the right ray?

c. (4 pts) Graph the function (be sure to label the scale of the axes)

\[ \begin{array}{c}
\text{Diagram of axes with axes}\n\end{array} \]

d. (2 pts) Describe how the graph \[ g(x) = 2|\pm x| + 5 \] compares to the graph in part c. Support your answer with a sketch.
Part III

8. A 750-seat theater charges $9.00 for adult admission and $5.00 for children. If the theater is full and $5038 is collected, how many adults and how many children are in the audience (you must show all your work)?

   a. (2 pts) Write a system of equations for this problem.

   b. (4 pts) Solve the system from part A.

9. (4 pts) How many solutions does the following system have? How do you know? Explain.

   \[ 3x + 9y = -6 \]
   \[ 4x - 12y = -8 \]

10. Simplify the following (leave as a fraction):

    a. (2 pts) \( \frac{12x^7}{3x^9} \)
    b. (2 pts) \( \frac{x^{-3}y^{-6}}{x^{-5}y^2} \)
    c. (3 pts) \( \frac{1}{\sqrt[3]{81}} \)
    d. (3 pts) \( \sqrt{\frac{49}{225}} \)
11. Write True or False for the following:

a. (2 pts) \( \sqrt{a} + \sqrt{b} = \sqrt{a + b} \) for all numbers \( a, b \geq 0 \).

_____  

b. (2 pts) The associative property holds for division.

_____  

c. (2 pts) \( \sqrt{-169} \) is 13.

_____  

d. (2 pts) The graph of \( y = 0.21(x - 7)^2 - 9 \) opens down.

_____  

e. (2 pts) \( f(x) = -3(x + 1)^2 - 2 \) and \( g(x) = -3x^2 - 6x - 5 \) are the same function, just in different forms.

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