MAT 112  Final Exam  Fall 2010
Instructor: Rashmi Deshpande
December 15, 2010

Instructions:

Do not open this booklet until you are told to do so. SHOW ALL WORK required in solving the problems. No work means zero 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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<thead>
<tr>
<th>Question</th>
<th>Points Possible</th>
<th>Points Earned</th>
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1. Consider the table to the right:

   a. What type of function is \( f(x) \)? Explain your reasoning. [1 point]

   b. What is the value of \( f(2) \)? [1 point]

   c. For what values of \( x \) is \( f(x) < 6 \)? [2 points]

   d. Find an equation of this function. [4 points]

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<th>( x )</th>
<th>( y = f(x) )</th>
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<td>8</td>
<td>-6</td>
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2. a. Write an equation of the line that passes through the point \((4, -2)\) and parallel to \(y = 0.5x - 12\). [4 points]

   b. What is the slope and y-intercept of the following equation? \(y = -4x + 9\) [2 points]

3. Solve for \( x \). [3 points each]

   a. \(-4x + 51 = 3x - 9\)

   b. \(-(-8 + 11x) < 52\)

   c. \(|3 - 5x| = 13\)

   d. \(3x^2 + 6x - 16 \leq 3x + 7\)
4. Simplify the following completely (leaving NO NEGATIVE EXPONENTS): [2 points each]
   a. \[ \frac{12x^7}{3x^9} \]
   b. \[ \frac{10x^3y^6}{30x^5y^2} \]
   c. \[ \frac{\sqrt[4]{81}}{3} \]
   d. \[ \sqrt{\frac{49}{225}} \]

5. Write True or False for the following. EXPLAIN your reasoning. [2 points each]
   a. \[ \sqrt{a} + \sqrt{b} = \sqrt{a + b} \] for all numbers \( a, b \geq 0 \).
      a. ________

   b. \[ 3\sqrt{-289} \] is 17.
      b. ________

   c. The graph of \( y = 0.31(x - 5)^2 - 9 \) opens up.
      c. ________

   d. \( f(x) = -5(x - 2)^2 - 5 \) and \( g(x) = -5x^2 - 20x - 5 \) are the same function, just in different forms.
      d. _____
6. Given the following systems of equations:
   i. Tell whether each system has infinitely many, one, or no solutions and provide a brief explanation. [9 points each]
   ii. If there is only one solution, solve the system for both variables algebraically. [3 points]

   a. $12x + 9y = 20$
      $16x + 12y = 15$

   b. $2x + 5y = 11$
      $5x + 2y = 11$

   c. $x + 2y = 4$
      $3x + 6y = 12$

7. Consider the algebraic following algebraic expression:

   $$-(7 - 15 + 17x) + (-7x + 3)$$

   a. Simplify this algebraic expression completely. [3 points]

   b. Evaluate the algebraic expression when $x = 7$ [2 points]
8. Find the \textbf{real} roots of the following quadratic equations, if there are any. [4 points each]

a. \( f(x) = x^2 - 5x - 20 \) 

b. \( f(x) = x^2 + 9x + 23 \)

9. Determine whether or not the following expressions are equivalent. If they are equivalent, state by which mathematical properties and if not, state “Not Equivalent”. [3 points each]

a. \(-4(3x - 5y - 3) \text{ and } 12 - 12x + 20y\)

b. \((11 - x) + 7y \text{ and } 11 - (x + 7y)\)
10. At a recent Syracuse University basketball game there was a total of 17,500 tickets sold. The price of an adult ticket is $30 and the price of a child ticket is $15. If the total amount collected from ticket sales was $450,000, how many adults and children bought tickets for the game?

a. Identify and assign symbols to the variables in this problem. [2 points]

b. Write the two symbolic rules relating the variables. [4 points]

c. Solve the problem to determine how many adult and child tickets were sold. [6 points]

11. Consider the following graph.

a. Write the equation of the function in the form $y = a|x - h| + k$. Explain how you get your values for $a$, $h$, and $k$.

b. How does $y = 2|x + 1| + 5$ compare to the equation you got in part a.? Support your answer with a sketch and explanation. [3 points]
12. Use the form of a quadratic function, \( y = a(x - h)^2 + k \), to answer the following about each function.  
*** Note that in part b. you must first put the equation into this form. [2 points] ***

- Tell whether the function will open upwards or downwards [1 point each]
- Give the Maximum/Minimum Value of the Function [1 point each]
- Sketch \textbf{EITHER} equation a. or equation b. on the provided graph [2 points]

a.  \( f(x) = -3(x + 7)^2 + 12 \)

b.  \( f(x) = 3x^2 - 6x + 3 \)