MAT 112 Final Exam Fall 2015
Instructor: Harman Aryal
December 16, 2015

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>
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1. Consider the table to the right:
   a. What type of function is \( f(x) \)? Explain your reasoning. [1 point]

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y = f(x) )</th>
</tr>
</thead>
<tbody>
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<tr>
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<td>-2</td>
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<tr>
<td>8</td>
<td>-6</td>
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</tbody>
</table>

   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]

2. a. Write an equation of the line that passes through the point (4, -2) and parallel to \( y = 4x - 12 \). [4 points]

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

3. Solve for \( x \). [4 points each]
   a. \(-4x + 51 = 3x - 9\)
   b. \(-(-8 + 11x) < 52\)
   c. \(|3 - 5x| = 13\)
   d. \(x^2 + 6x - 16 \leq 3x + 2\)
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. \( \frac{\sqrt{49}}{\sqrt{225}} \)

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. \( \sqrt[3]{289} \) 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. [2 points each]
   ii. If there is only one solution, solve the system for both variables algebraically. [2 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 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 real roots of the following quadratic equations, if there are any. [5 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. \(-4(3x - 5y - 3)\) and \(12 - 12x + 20y\)
   b. \((11 - x) + 7y\) 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. [2 points]

   c. Solve the problem to determine how many adult and child tickets were sold. [2 points]

11. Consider the following graph.
   a. Write the equation of the function in the form \( y = a|x - h| + k \). [4 points]

   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 both equations on the provided graphs [2 points each each]

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

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