MAT 112 Final Exam Fall 2014  
Instructor: Joshua Jones

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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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]

   \[ x \quad | \quad y = f(x) \]
   \[ 0 \quad | \quad 10 \]
   \[ 2 \quad | \quad 6 \]
   \[ 4 \quad | \quad 2 \]
   \[ 6 \quad | \quad -2 \]
   \[ 8 \quad | \quad -6 \]

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? [2 pts]
      \[ y = -4x + 9 \]

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. \( \sqrt{\frac{49}{225}} \)

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. \( \sqrt[3]{289} \) 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 pts.]

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 pts each]

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

b. \( f(x) = 3x^2 - 6x + 3 \)
MAT 112 Final Exam Fall 2014
Instructor: Scott Baumgartner
December 11, 2013

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