MAT 112 Final Exam Spring 2010

May 10, 2010

Instructions:

Do not open this booklet until you are told to do so. Show all work required to solve the problems. Unsupported claims may not receive 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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<td>TOTAL</td>
<td>108</td>
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1. Consider the table to the right:

<table>
<thead>
<tr>
<th>x</th>
<th>y = f(x)</th>
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<td>0</td>
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<tr>
<td>2</td>
<td>6</td>
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<tr>
<td>4</td>
<td>2</td>
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<tr>
<td>6</td>
<td>-2</td>
</tr>
<tr>
<td>8</td>
<td>-6</td>
</tr>
</tbody>
</table>

a. (2 pts) Is this function linear? Explain.

b. (1 pts) What is the value of f(6)?

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

d. (4 pts) Find an equation of this function.

2. a. (4 pts) Write an equation of the line that passes through the point (3, -1) and parallel to \( \frac{1}{2} x + 11 \).

b. (2 pts) What is the slope and y-intercept of \( y = -3x + 7 \)?

3. 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) \(-(9 - 4x) \geq 0\)
4. Simplify the following (leave as fractions):

   a. (2 pts) \[ \frac{12x^7}{3x^9} \]
   
   b. (2 pts) \[ \frac{10x^3y^6}{30x^5y^2} \]

   c. (2 pts) \[ \frac{\sqrt[3]{81}}{3} \]
   
   d. (2 pts) \[ \sqrt[3]{\frac{49}{225}} \]

5. 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) \[ \sqrt[3]{-169} \] is 13. __________

   c. (2 pts) The graph of \( y = 0.21(x - 7)^2 - 9 \) opens up. _________________

   d. (2 pts) \( f(x) = -3(x - 1)^2 - 2 \) and \( g(x) = -3x^2 - 6x - 5 \) are the same function, just in different forms. _________________
6. Given the following systems of equations, tell whether each system has infinitely many, one, or no solutions and provide a brief explanation. (10 pts)

   a. \[15x + 9y = 18\]
      \[20x + 12y = 9\]

   b. \[2x + 7y = 11\]
      \[7x + 2y = 11\]

   c. \[x + 2y = 4\]
      \[2x + 4y = 8\]

7. a. (4 pts) Simplify this algebraic expression: \(- (8 - 10 + 13x) + (-5x + 6)\)

    b. (2 pts) Evaluate the algebraic expression from a. for \(x = 5\).
8. Find the roots of the following quadratic equations.

   a. (4 pts) \( f(x) = x^2 - 9x - 22 \)

   b. (4 pts) \( f(x) = x^2 + 14x + 23 \)

9. Recall the height of a ball after \( t \) seconds is given by \( h(t) = \frac{1}{2}(-9.8)t^2 + v_0 t + s_0 \) where \( v_0 \) is the initial velocity and \( s_0 \) is the initial height. You throw a ball straight up at a velocity of 19.6 meters per second from a height of 250 meters.

   a. (1 pt) Give a function for the height of the ball after \( t \) seconds.

   b. (4 pts) What is the maximum height reached by the ball?

   c. (3 pts) How long will it take for the ball to reach the ground? (round your answer to 2 decimal places)

   d. (2 pts) What is an appropriate domain for your function in part a?
10. At a recent Syracuse University basketball game there was a total of 15,500 tickets sold. The price of an adult ticket is $30 and the price of a child ticket is $10. If the total amount collected from ticket sales was $320,000, how many adults and children bought tickets for the game?

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

   b. (4 pts) Write the two symbolic rules relating the variables.

   c. (6 pts) Solve the problem to determine how many adult and child tickets were sold.

11. Determine whether or not the following expressions are equivalent. If they are equivalent, state by which mathematical properties and if not, state Not Equivalent and provide a counterexample.

   a. (3 pts) $-4(x+2y-3)$ and $12-4x-8y$

   b. (3 pts) $(13-x)+8y$ and $13-(x+8y)$
12. Consider the following graph.

a. (4 pts) Write the equation of the function in the form \( y = a|x - h| + k \).

b. (3 pts) How does \( y = 2|x + 1| + 5 \) compare to the equation you got in part a? Support your answer with a sketch and explanation.

13. Using the standard form of a quadratic function, \( y = a(x - h)^2 + k \):
- Give the vertex of the function (1 pt for each)
- Tell whether the function will open upwards or downwards (1 pt for each)
- Give the Maximum/Minimum Value of the Function (1 pt for each)
- Sketch either a. or b. on the provided graph (2 pts)

a. \( f(x) = 3(x + 5)^2 - 10 \)

b. \( f(x) = -6(x - 1)^2 \)