

Math 1120 – College Algebra I
EXAM FOUR: Sections 2.5, R.7, 3.1 and 3.2
Tuesday, April 19, 2011

Name: _____

Instructor: _____ ClassTime _____

- If your instructor is not standing in the room you are in the wrong room. Talk to an instructor and they will direct you to the correct room.
- Make sure all cells phones, ipods, mp3 players and other electronic devices are turned off and put away. The only items that should be on your desk are your calculator, test paper and writing implement.
- Turn your hat around.
- Make sure your book bag is closed and under your seat.
- Once you have started the exam you may not leave the room until you are finished with your exam and have turned it in.
- We cannot answer questions about how to do a problem or using the calculator. We will answer questions that are for clarification of what is being asked or strange error messages on the calculator.
- You should have 4 different pieces of paper. Three pages printed on the front and back and the last printed on just the front. If you need extra room for a problem you can use the back of the last page.
- When you are finished, make sure you turn your test into YOUR instructor and you are free to leave.
- **Show all work** to receive credit for each of the problems. A problem worth more than 2 points with the correct answer and no work, will receive **NO CREDIT**.
- Incorrect answers with incorrect work shown or no work shown will NOT receive any credit.
- **Circle your answers** and when appropriate **label** them.
- When a question asks for an explanation, write in **complete sentences**.
- Answers that are inequalities can be given in any notation.

1. (3 pts each) Simplify the expressions. **Give exact answers in simplified radical form.** Assume that all variables are positive. Remember to show work to get credit.

a. $\sqrt{x} \cdot \sqrt[5]{x^4}$

b. $\frac{\sqrt{a^4 b^3}}{\sqrt{b}}$

c. $\sqrt[3]{2x^4} \cdot \sqrt[3]{-36x^2}$

2. (2 pts each) Simplify the following expressions. Assume that all variables are positive. **Give exact answers in simplified radical form.**

a. $\sqrt[3]{405}$

b. $\sqrt[4]{81x^3y^8}$

3. (3 pts each) Simplify the following expressions. Assume that all variables are positive. **Give exact answers in simplified radical form.**

a. $4\sqrt{32x} + 5\sqrt{72x}$

c. $(\sqrt{7} - 2)(\sqrt{7} - 2)$

4. (5 pts each) Circle the word that describes the type of equation given, and then solve the equation symbolically. Give exact answers.

a. $x(x - 9) = 22$

Linear Quadratic Neither

b. $x^2 - 7x = -5$

Linear Quadratic Neither

c. $\frac{1}{3}(x - 2) + \frac{5}{3} = \frac{2}{5}x$

Linear Quadratic Neither

5. (6 pts) Solve the following equations symbolically for x .

a. $|x - 5| = 7$

b. $|5x + 3| + 7 = 4$

6. (4 pts) Solve the following inequality symbolically for x .

$$|6x - 2| < 3$$

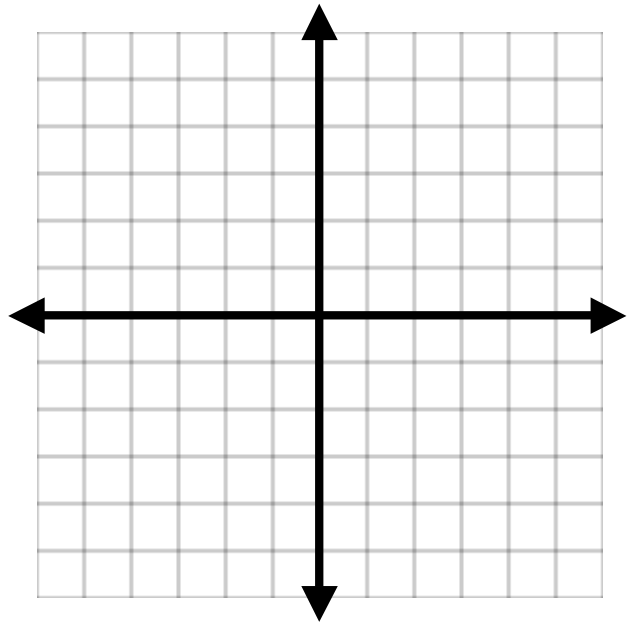
7. Use the function $f(x) = \frac{1}{2}(x - 3)^2 - 2$ for parts a – d below.

a. (2 pts) Identify the vertex.

b. (1 pts) Identify the leading coefficient.

c. (4 pts) Find the x -intercepts symbolically.

d. (3 pts) Use your information from parts a – c to draw the graph of $f(x) = \frac{1}{2}(x - 3)^2 - 2$ on the grid at the right. Make sure to include at least 3 points on the graph and capture the basic shape. We will assume that x -scale and y -scales are 1 unless stated otherwise.



8. Use the function $g(x) = -x^2 + 5x - 2$ for parts a and b below.

a. (3 pts) Use the vertex formula to find the vertex of $g(x)$

b. (2 pts) Choose the best answer.

The function $g(x) = -x^2 + 5x - 2$ attains _____ at the vertex found in part (a).

A) its maximum

B) its minimum

C) neither the maximum nor the minimum

9. The table below shows the average high temperature for various months in Bowling Green, OH.

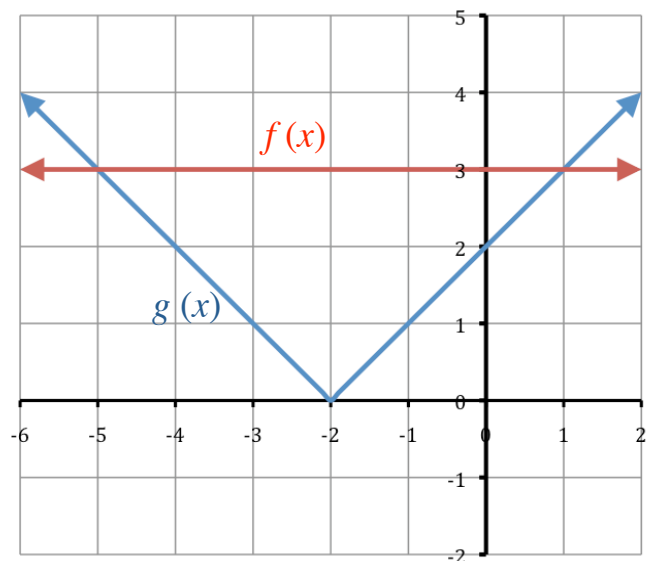
		January	March	May	July	September	November
Month	x	1	3	5	7	9	11
Temperature ($^{\circ}\text{F}$)	y	31	46	71	84	75	49

<http://www.weather.com/weather/wxclimatology/monthly/graph/43403>

- a. (2 pts) Use your calculator to make a scatterplot of the data. Choose the best answer that describes the data based on the shape of the scatterplot. You do not have to show your scatterplot.
- A) The data is approximately linear.
- B) The data is approximately quadratic.
- C) The data does not resemble a linear or quadratic function.
- b. (2 pts) Based on your answer from part a, use least squares regression to write an equation that models the data given in the table. Round values to 5 decimal places.
- c. (2 pts) **Using your answer to part b**, estimate the average high temperature in Bowling Green, OH during the month of August ($x = 8$). Round answer to the nearest tenth of a degree.

10. (2 pts) The x -intercepts of the graph of $f(x) = (5x + 2)(4x - 3)$ are _____ and _____.

11. (2 pts) The graphs of two functions $f(x)$ and $g(x)$ are shown in the graph at the right. Solve the inequality $f(x) \leq g(x)$.



12. (3 pts) Write the function $f(x) = 2(x + 4)^2 + 5$ in the form $f(x) = ax^2 + bx + c$.

13. The shape of the Gateway Arch in St. Louis closely resembles a parabola. The function $f(x) = -\frac{2}{315}x^2 + 4x$ closely models the shape of the arch, where $f(x)$ is the height in feet and x is the horizontal distance from the base of the left side of the arch in feet. **You can solve the following questions either graphically or symbolically.**



a. (2 pts) How tall is the tower 2 feet from the base of the left side? Give answer(s) to the nearest foot.

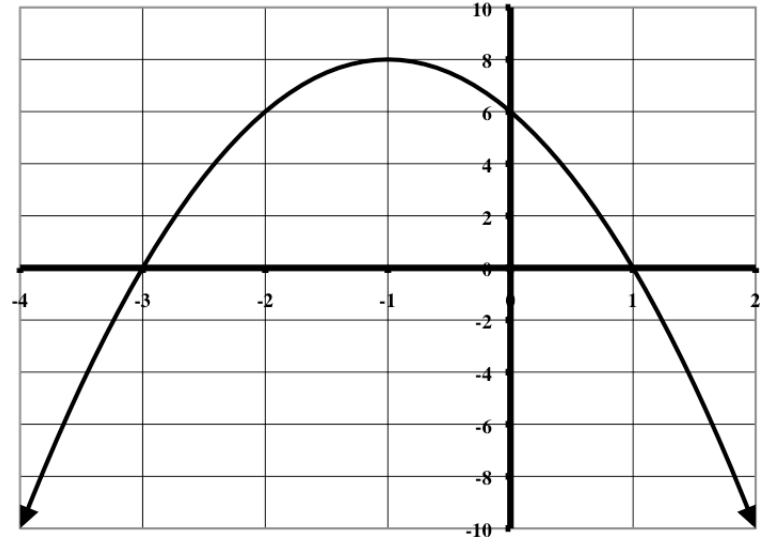
b. (2 pts) **Write an equation** to calculate how far from the base of the left side of the arch a person who is 6 feet tall needs to stand so that their head just hits the arch. You will solve this equation in part c.

c. (2 pts) Solve the equation in part b. Round answer(s) to 1 decimal place.

d. (2 pts) What is the maximum height of the Gateway Arch?

e. (2 pts) How far is it **from the base** of the left side of the arch **to the base** at the right side of the arch?

14. (2 points each) Use the graph of the quadratic function, $f(x)$ at the right to answer the following questions.



- a. The range of the function is _____.
- b. The vertex of the function is _____.
- c. The equation of the axis of symmetry is _____.
- d. On what interval is $f(x)$ increasing. **Choose the best answer.**
- A. $[-1, \infty)$ B. $(-\infty, -1]$ C. $[8, \infty)$ D. $(-1, 8)$
- E. $[-3, 1]$ F. $(-\infty, -3]$ G. $[1, \infty)$ H. $(-\infty, \infty)$ I. $(-\infty, 8]$
- e. $f(-2) =$ _____.
- f. The average rate of change of $f(x)$ from $x_1 = -2$ to $x_2 = -1$ is _____.
- g. Find all values of x such that $f(x) = 0$.
- h. Circle the best response. The sign of the leading coefficient _____.
- I. is positive II. is negative III. cannot be determined from the graph.
- i. The y -intercept(s) of the function is/are _____.