

Name: \_\_\_\_\_

Section: \_\_\_\_\_

MA 109

Fall 2013

Exam 2

October 23, 2013

**Directions:**

- Do not remove this page—you will turn in the entire exam. You have two hours to do this exam. No books or notes may be used. You may use a graphing calculator during the exam, but NO calculator with a Computer Algebra System (CAS) or a QWERTY keyboard is permitted. Absolutely no cell phone use during the exam is allowed.
- The exam consists of multiple choice and short answer questions. Record your answers on this page by filling in the appropriate selection, for example:

A  B  C  D  E.

- The exam is out of 100 total points: 5 points for each of 20 questions. **Only** this front page will be graded and **no partial credit** will be awarded. It is recommended that you check your work!

1.  A  B  C  D  E

2.  A  B  C  D  E

3.  A  B  C  D  E

4.  A  B  C  D  E

5.  A  B  C  D  E

6.  A  B  C  D  E

7.  A  B  C  D  E

8.  A  B  C  D  E

9.  A  B  C  D  E

10.  A  B  C  D  E

11.  A  B  C  D  E

12.  A  B  C  D  E

13.  A  B  C  D  E

14.  A  B  C  D  E

15.

16.

17.

18.

19.

20.

**For grading use:**

<b>Total</b>	
	<b>(out of 100 pts)</b>

Name: \_\_\_\_\_

Section: \_\_\_\_\_

**Multiple Choice:** Show your work in the space below and shade the correct answer on the front page for each of the following.

1. Determine the number of solutions to the system  $\begin{cases} 3x - 8y = -8 \\ x + y = 1 \end{cases}$

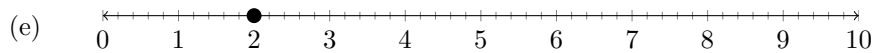
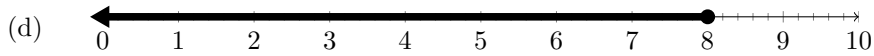
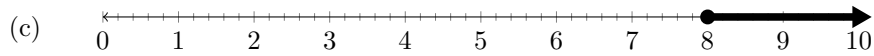
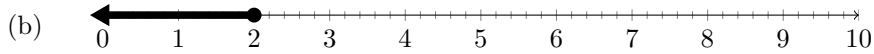
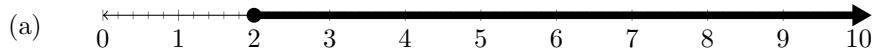
**Choices:**

- (a) One real solution
- (b) No real solutions
- (c) Four real solutions
- (d) Two real solutions
- (e) Infinitely many real solutions

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2. Which is the full set of solutions to  $4x + 7 \leq 15$ ?

**Choices:**



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3. Let  $f(x) = \frac{1}{3x-7}$ . Find the domain of  $f(x)$ .

**Choices:**

- (a)  $(-\infty, 3) \cup (7, \infty)$
  - (b)  $(-\infty, \infty)$
  - (c)  $\left(-\infty, \frac{7}{3}\right) \cup \left(\frac{7}{3}, \infty\right)$
  - (d)  $[7, \infty)$
  - (e)  $\left[\frac{7}{3}, \infty\right)$
- 

4. Let  $f(x) = \frac{2}{x-3}$ . Find  $f(a+1)$ .

**Choices:**

- (a)  $\frac{2}{a-2}$
  - (b)  $\frac{2}{a-3} + 1$
  - (c)  $\frac{3}{a-3}$
  - (d)  $\frac{2}{a-3}$
  - (e)  $\frac{2}{x-3} \cdot (a+1)$
- 

5. Use the Intersect or Intercept Method to approximate all real solutions to the equation below using your calculator.

$$x^2 = \sqrt{x+5}$$

**Choices:**

- (a)  $x \approx -1.3794$  and  $x \approx 1.6030$
  - (b)  $x \approx -1.3794$  and  $x \approx 1.9028$
  - (c)  $x \approx -1.2766$  and  $x \approx 1.4894$
  - (d)  $x \approx 1.6030$  and  $x \approx 2.5696$
  - (e)  $x \approx -1.2766$  and  $x \approx 1.6297$
-

6. Determine all solutions to the system 
$$\begin{cases} (x-3)^2 + (y-2)^2 = 9 \\ x - y = -2 \end{cases}$$

**Choices:**

- (a)  $(1, 2 + \sqrt{5})$
  - (b)  $(6, 8)$
  - (c)  $(1, 3)$
  - (d)  $(0, 2), (3, 5)$
  - (e)  $(3, -1), (6, 2)$
- 

7. How many real solutions does the equation  $x^4 - x - 4 = 2x + 4$  have?

**Choices:**

- (a) Exactly four real solutions.
  - (b) Exactly two real solutions.
  - (c) Exactly one real solution.
  - (d) The equation has no real solutions.
  - (e) Exactly three real solutions.
- 

8. Which of the following statements best describes the system of equations? 
$$\begin{cases} 6x - 3y = 3 \\ 2x - y = 1 \end{cases}$$

**Choices:**

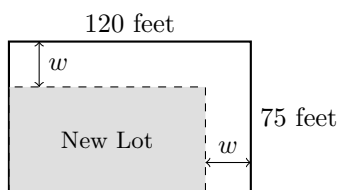
- (a) The system is dependent. Two solutions to the system are  $(1, 1)$  and  $(3, 5)$ . One point that is NOT a solution to the system is  $(0, 0)$ .
  - (b) The system is dependent. Two solutions to the system are  $(4, 5)$  and  $(2, 7)$ . One point that is NOT a solution to the system is  $(1, 1)$ .
  - (c) The system is consistent. It has exactly one solution which is  $(1, 1)$ .
  - (d) The system is dependent. Every point is a solution to the system.
  - (e) The system is inconsistent. Therefore the system has no solutions.
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9. How many liters of a 15% solution of acid must be mixed with 10 liters of a 24% solution of acid to produce an 18% solution of acid?

**Choices:**

- (a)  $\frac{70}{3}$  liters.
- (b) The final solution can not be obtained.
- (c)  $\frac{1}{2}$  liters.
- (d) 10 liters.
- (e) 20 liters.

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10. A corner lot has dimensions 75 by 120 feet. The city plans to take a strip of uniform width along the two sides bordering the streets to widen these roads. The width of the strip is  $w$  feet, as shown in the picture. The area of the new lot is 8050 square feet. To find  $w$ , which of the following equations would you solve?



**Choices:**

- (a)  $75 \cdot 120 = 8050 + w$
- (b)  $9000w = 8050$
- (c)  $8050 - w = 9000$
- (d)  $75(120 - w) = 950$
- (e)  $(75 - w)(120 - w) = 8050$

- 
11. Which one of the following equations can not be solved algebraically and so must be solved graphically?

**Choices:**

- (a)  $\frac{1}{x+1} - \frac{5}{x-3} = 10$
- (b)  $x^2 - x + 1 = 5x + 10$
- (c)  $3x^7 - 1 = 0$
- (d)  $x^5 + x^4 = x^2 - 1$
- (e)  $\sqrt{x-2} = 5x$

12. A ball is thrown straight upward at an initial speed of 192 ft/sec. From physics, it is known that after  $t$  seconds the ball reaches a height  $h$  feet given by the formula

$$h = -16t^2 + 192t.$$

When is the ball more than 560 feet above the ground?

**Choices:**

- (a) Between 0 and 4 seconds and also after 6 seconds
- (b) Only at 6 seconds
- (c) Between 4 seconds and 6 seconds
- (d) Between 5 seconds and 7 seconds
- (e) Between 0 and 5 seconds and also after 7 seconds

13. Which is the full set of solutions to  $|7 - x| \leq 3$ ?

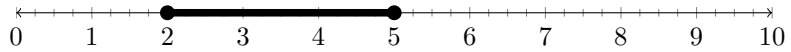
**Choices:**

- (a)  $(-\infty, 3] \cup [7, \infty)$
- (b)  $(-\infty, 4] \cup [10, \infty)$
- (c)  $[4, 10]$
- (d)  $[3, 7]$
- (e)  $[-10, -4]$

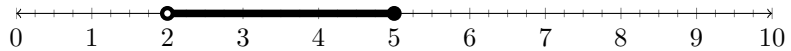
14. Which is the full set of solutions to  $\frac{x + 4}{x - 2} \geq 3$ ?

**Choices:**

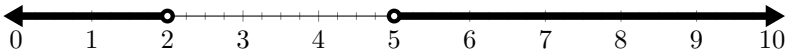
- (a)  $[2, 5]$



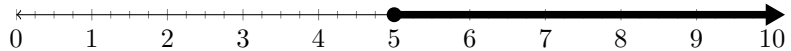
- (b)  $(2, 5]$



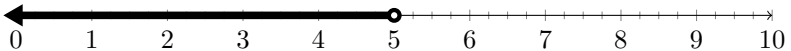
- (c)  $(-\infty, 2) \cup (5, \infty)$



- (d)  $[5, \infty)$



- (e)  $(-\infty, 5)$



**Short Answer:** Show your work below and place the appropriate answer on front page for each of the following.

15. Let

$$f(x) = \begin{cases} 3x - 1 & \text{if } x \leq -2 \\ x^2 & \text{if } -2 < x \leq 1 \\ -2x + 1 & \text{if } x > 1 \end{cases}$$

Find  $f(2)$ .

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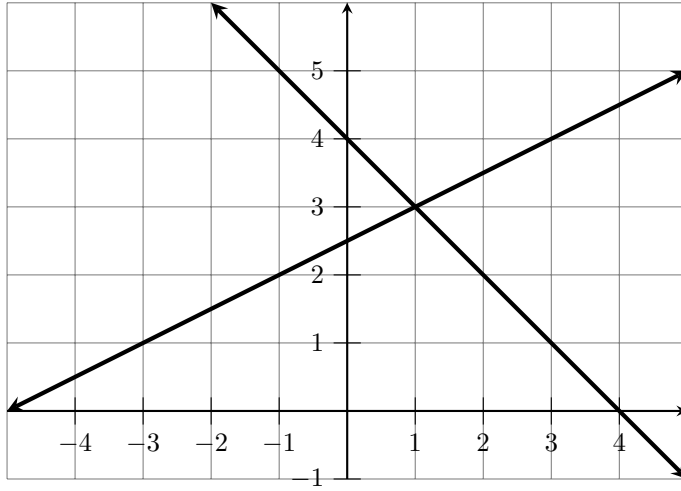
16. Let  $f(x) = x^2 - 1$ . Find  $\frac{f(x+h) - f(x)}{h}$  and simplify. (Assume  $h \neq 0$ .)

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17. A circle has a radius of 10 centimeters. If the radius increases by 3 centimeters, by how much does the area of the circle increase?

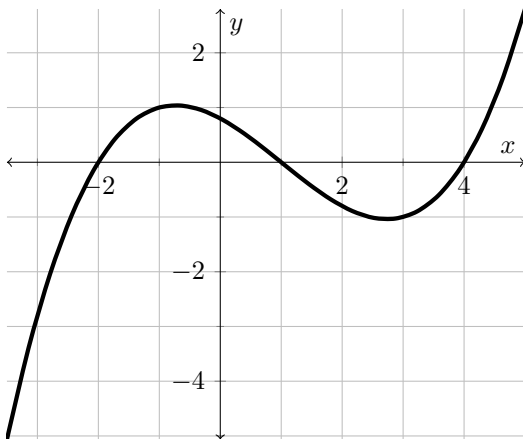
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18. Suppose you are given a system of equations whose graphs are shown in the picture below. Determine an approximate solution to this system.



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19. Let  $f(x) = x^2 - \sqrt{x} + 1$ . Find  $f(9)$ .

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20. The graph of  $y = g(x)$  is shown below. Use the graph to answer the question.



What is  $g(-1)$ ?