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:

$$\bullet \text{(A)} \quad \text{(B)} \quad \text{(C)} \quad \text{(D)} \quad \text{(E)}.$$

- 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!

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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:

Total	
	(out of 100 pts)

1

Multiple Choice: Show your work in the space below and shade the correct answer on the front page for each of the following.
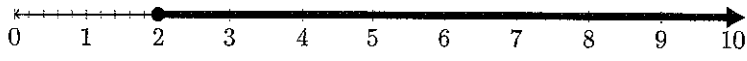
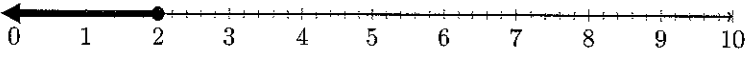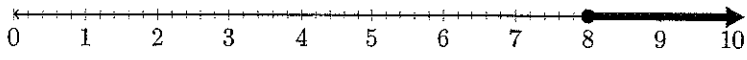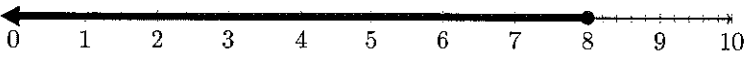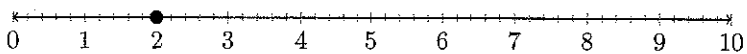1. Determine the number of solutions to the system $\begin{cases} 3x - 8y = -8 \\ x + y = 1 \end{cases}$

   Choices:

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

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

   Choices:

   (a)

   (b)

   (c)

   (d)

   (e)

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

Choices:

(a) $(-\infty, 3) \cup (7, \infty)$

(b) $(-\infty, \infty)$

(c) $\left(-\infty, \dfrac{7}{3}\right) \cup \left(\dfrac{7}{3}, \infty\right)$

(d) $[7, \infty)$

(e) $\left[\dfrac{7}{3}, \infty\right)$

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

Choices:

(a) $\dfrac{2}{a - 2}$

(b) $\dfrac{2}{a - 3} + 1$

(c) $\dfrac{3}{a - 3}$

(d) $\dfrac{2}{a - 3}$

(e) $\dfrac{2}{x - 3} \cdot (a + 1)$

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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 $\begin{cases} (x-3)^2 + (y-2)^2 = 9 \\ \qquad\qquad x - y = -2 \end{cases}$

Choices:

(a) $(1, 2 + \sqrt{5})$

(b) $(6, 8)$

(c) $(1, 3)$

(d) $(0, 2), (3, 5)$

(e) $(3, -1), (6, 2)$

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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.

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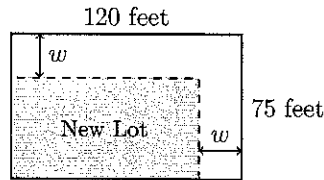
Choices:

(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.

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) $\dfrac{70}{3}$ liters.

(b) The final solution can not be obtained.

(c) $\dfrac{1}{2}$ 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) $(75 - w)(120 - w) = 8050$

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

Choices:

(a) $\dfrac{1}{x+1} - \dfrac{5}{x-3} = 10$

(b) $x^2 - x + 1 = 5x + 10$

(c) $3x^7 - 1 = 0$

(d) $x^5 + x^4 = x^2 - 1$

(e) $\sqrt{x - 2} = 5x$

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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

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

Choices:

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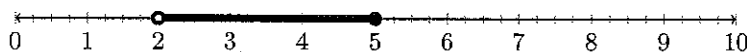   (d) $[3, 7]$
   (e) $[-10, -4]$

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14. Which is the full set of solutions to $\dfrac{x+4}{x-2} \ge 3$?
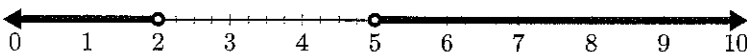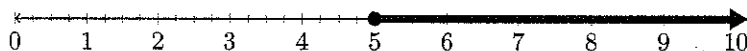
Choices:

   (a) $[2, 5]$
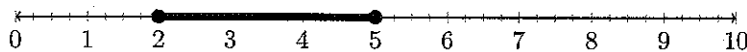
   (b) $(2, 5]$

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

   (d) $[5, \infty)$

   (e) $(-\infty, 5)$
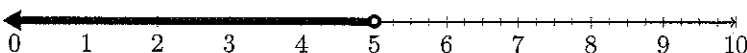
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15. Let

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

Find $f(2)$.

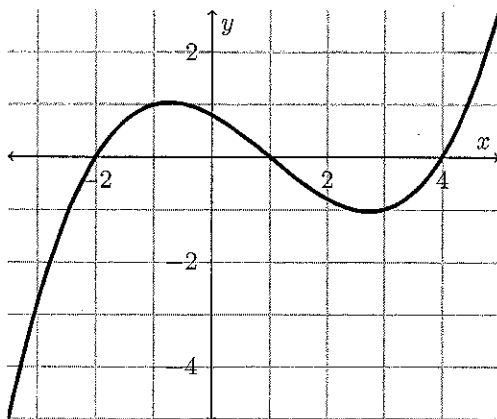16. Let $f(x) = x^2 - 1$. Find $\dfrac{f(x + h) - f(x)}{h}$ and simplify. (Assume $h \neq 0$.)

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?

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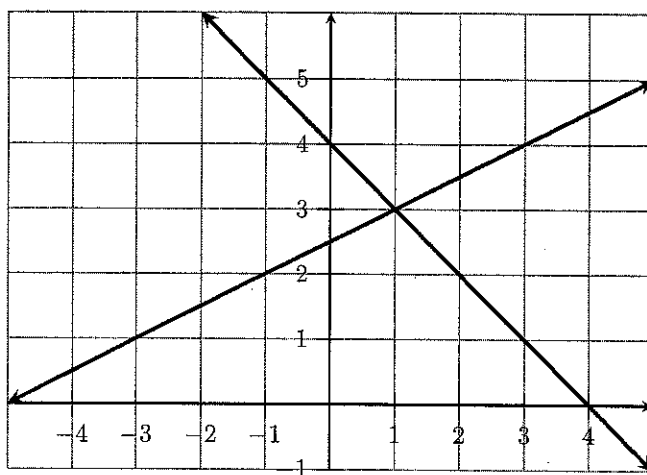
19. Let $f(x) = x^2 - \sqrt{x} + 1$. Find $f(9)$.

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

What is $g(-1)$?