

Name: _____

Section: _____

MA 109

Spring 2014

Exam 1

February 12, 2014

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. A B C D E

16.

17.

18.

19.

20.

For grading use:

Total	
	(out of 100 pts)

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. Solve the following equation for x .

$$3x^2 - 5x = 1$$

$$3x^2 - 5x - 1 = 0$$

Choices:

(a) $\frac{1 \pm \sqrt{13}}{2}$

(b) $\frac{5 \pm \sqrt{37}}{6}$

(c) $\frac{-5 \pm \sqrt{37}}{6}$

(d) There are no real solutions.

(e) $\frac{5 \pm \sqrt{13}}{6}$

$$\begin{aligned} X &= \frac{-(-5) \pm \sqrt{(-5)^2 - 4(3)(-1)}}{2(3)} \\ &= \frac{5 \pm \sqrt{25 + 12}}{6} \\ &= \frac{5 \pm \sqrt{37}}{6} \end{aligned}$$

2. Which one of the following points is on the graph of the equation

$$x - x^2y = 5?$$

Choices:

(a) (0, 5)

(b) (1, 4)

(c) (-1, -6)

(d) (-1, 6)

(e) (-2, -1)

$$\begin{aligned} (0, 5) &\rightarrow 0 - 0^2(5) = 0 \neq 5 \\ (1, 4) &\rightarrow 1 - (1)^2(4) = 1 - 4 = -3 \neq 5 \\ (-1, -6) &\rightarrow -1 - (-1)^2(-6) = -1 + 6 = 5 \checkmark \\ (-1, 6) &\rightarrow -1 - (-1)^2(6) = -1 - 6 = -5 \neq 5 \\ (-2, -1) &\rightarrow -2 - (-2)^2(-1) = -2 + 4 = 2 \neq 5 \end{aligned}$$

3. Solve the following equation for s.

$$\frac{8(3-s)^2}{8} = \frac{16}{8}$$

Choices:

- (a) $\pm\sqrt{5}$
- (b) $\sqrt{8}$
- (c) $\sqrt{2}$
- (d) The equation can not be solved for s.
- (e) $3 \pm \sqrt{2}$

$$(3-s)^2 = 2$$

$$3-s = \pm\sqrt{2}$$

$$3 \pm \sqrt{2} = s$$

4. Solve the following equation for x.

$$(\sqrt{2x-1})^2 = (x-2)^2$$

Choices:

- (a) The equation has no solutions.
- (b) $x = 1$ only.
- (c) $x = 1$ and $x = 5$.
- (d) $x = 5$ only.
- (e) $x = -3$ and $x = 2$.

$$2x-1 = x^2-4x+4$$

$$0 = x^2-6x+5 = (x-5)(x-1)$$

$x = 5, x = -1$ ← check answers

$$\sqrt{2(5)-1} = 5-2$$

$$\sqrt{9} = 3 \checkmark$$

$$\sqrt{2(-1)-1} = -1-2$$

$$\sqrt{-3} = -3 \leftarrow \text{has not solution}$$

5. Solve the following equation for x.

$$x^2(x^3+5) = 0$$

zero product property

Choices:

- (a) The equation has no solutions.
- (b) $x = 0$ only.
- (c) $x = \sqrt[3]{-5}$ only.
- (d) $x = 0$ and $x = \sqrt[3]{-5}$
- (e) $x = \pm\sqrt[3]{5}$ only.

$$x^2 = 0$$

$$x = 0$$

$$x^3 + 5 = 0$$

$$x = \sqrt[3]{-5}$$

6. Find the value of k that makes the following expression a perfect square.

$$x^2 - 6x + k.$$

$$\frac{-6}{2} = -3$$

$$x^2 - 6x + 9 \leftarrow (-3)^2 = 9$$

$$= (x - 3)^2$$

Choices:

- (a) 3
- (b) 9
- (c) $\frac{3}{2}$
- (d) -9
- (e) $-\frac{9}{4}$

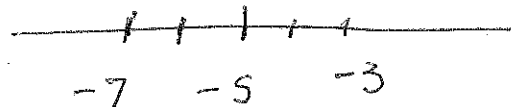
7. Solve the following equation for x .

$$|x + 5| = 2$$

$$|x - (-5)| = 2$$

distance from x to -5 is 2

$$x - 2 \rightarrow x - 2 \leftarrow$$



Choices:

- (a) $x = -3$ and $x = -7$.
- (b) $x = -3$ only.
- (c) $x = 3$ only.
- (d) $x = 7$ only.
- (e) $x = -1$ only.

8. Find the distance between the points $(-2, 1)$ and $(1, -3)$.

Choices:

- (a) $\sqrt{5}$
- (b) $\sqrt{7}$
- (c) 5
- (d) ± 5
- (e) 25

$$d = \sqrt{(-2 - 1)^2 + (1 - (-3))^2}$$

$$= \sqrt{(-3)^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25} = 5$$

9. Find the exact value of

$$|\sqrt{2}-3|.$$

$$\sqrt{2}-3 < 0$$

$$\text{so } |\sqrt{2}-3| = -(\sqrt{2}-3) = 3-\sqrt{2}$$

Choices:

- (a) $\sqrt{2}+3$.
- (b) $3-\sqrt{2}$
- (c) 1.5858
- (d) $-3+\sqrt{2}$
- (e) -1

10. Find k so that the following equation has only one solution.

$$x^2 - 3x + k = 0$$

$$b^2 - 4ac = 0$$

$$(-3)^2 - 4(1)(k) = 0$$

$$9 - 4k = 0$$

$$k = \frac{-9}{-4} = \frac{9}{4}$$

Choices:

- (a) $-\frac{4}{9}$
- (b) $\frac{9}{4}$
- (c) 9
- (d) $\frac{3}{2}$
- (e) 0

11. Find the equation of a circle with center $(5, 1)$ such that the point $(5, 7)$ is on the circle.

Choices:

- (a) $(x+2)^2 + (y+7)^2 = 4$
- (b) $(x-5)^2 + (y-1)^2 = 6$
- (c) $(x-2)^2 + (y-7)^2 = 4$
- (d) $(x+5)^2 + (y+1)^2 = 49$
- (e) $(x-5)^2 + (y-1)^2 = 36$

$$\begin{aligned} r &= \sqrt{(5-5)^2 + (1-7)^2} \\ &= \sqrt{0 + 6^2} = \sqrt{36} = 6 \\ \rightarrow (x-5)^2 + (y-1)^2 &= 6^2 \end{aligned}$$

12. How many distinct real solutions does the equation $x^3 - x^2 + 4x - 4 = 0$ have?

Choices:

- (a) Two real solutions.
- (b) One real solution.
- (c) Four real solutions.
- (d) Three real solutions.
- (e) No real solutions.

$$x^2(x-1) + 4(x-1) = 0$$

$$(x^2+4)(x-1) = 0$$

$$x^2+4=0 \quad x-1=0$$

no solution one solution

13. Find the x and y -intercepts of the graph of

$$x+y^2-4=0$$

$$\begin{array}{l} \text{y int } x=0 \\ y^2-4=0 \\ y=\pm 2 \end{array}$$

$$\begin{array}{l} \text{x int } y=0 \\ x-4=0 \\ x=4 \end{array}$$

Choices:

- (a) The x intercepts are $x = 2$ and $x = -2$ and the y intercept is $y = 4$.
- (b) The x intercept is $x = 4$ and the y intercept is $y = 2$.
- (c) The x intercept is $x = 4$ and there are no y intercepts.
- (d) The x intercept is $x = 4$ and the y intercepts are $y = 2$, and $y = -2$.
- (e) The x intercept is $x = -4$ and the y intercepts are $y = 2$, and $y = -2$.

14. Which one of the following statements is not true?

Choices:

- (a) $\sqrt{x^2} = x$ for all real numbers x .
- (b) $|x - y| = |y - x|$ for all real numbers x and y .
- (c) a has two square roots for all real numbers $a > 0$.
- (d) $|a|$ can never be negative for all real numbers a .
- (e) $\sqrt{a^2} = |a|$ for all real numbers a .

$$\sqrt{x^2} \neq x \text{ when } x \text{ is negative}$$

15. Which one of the equations represents the statement that the distance from -2 to a number x on the number line is 7?

Choices:

- (a) $|x - 7| = 2$
- (b) $|7 + x| = 2$
- (c) $|x - 2| = 7$
- (d) $|x + 2| = 7$
- (e) $|7 - 2| = x$

$$|x - (-2)| = 7$$

$$|x + 2| = 7$$

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

16. Solve the equation for x . Include all solutions in your answer on the front of the exam.

$$\text{L.C.D.} = (x+1)(x+3) \quad \frac{1}{x+1} + \frac{3}{(x+1)(x+3)} = \frac{2}{x+3}$$

$$(x+1)(x+3) \left(\frac{1}{x+1} + \frac{3}{(x+1)(x+3)} \right) = \left(\frac{2}{x+3} \right) (x+1)(x+3)$$

$$x+3 + 3 = 2(x+1)$$

$$x+6 = 2x+2$$

$$4 = x$$

17. Find the center of the circle

$$x^2 - 2x + y^2 + 6y - 10 = 0.$$

$$\frac{-2}{2} = -1 \quad (-1)^2 = 1 \quad x^2 - 2x + 1 + y^2 + 6y + 9 = 10 + 1 + 9$$

$$\frac{6}{2} = 3 \quad (3)^2 = 9 \quad (x-1)^2 + (y+3)^2 = 20$$

Center = $(1, -3)$

18. Solve the equation for R .

$$\frac{1}{R} = \frac{1}{V} + \frac{1}{W} \quad \text{L.C.D.} = RVW$$

$$RVW \left(\frac{1}{R} \right) = \left(\frac{1}{V} + \frac{1}{W} \right) RVW$$

$$VW = RW + RV$$

$$VW = R(W+V)$$

$$\frac{VW}{W+V} = R$$

19. Find all real solutions to the equation $x^4 - 5x^2 + 4 = 0$.

$$u = x^2$$
$$u^2 = x^4$$

$$u^2 - 5u + 4 = 0$$
$$(u - 4)(u - 1) = 0$$

$$u = +4 \quad u = 1$$
$$x^2 = 4 \quad x^2 = 1$$

$$x = \pm 2 \quad x = \pm 1$$

20. Solve for s .

$$5 \left(\frac{8 - 2s}{5} \right) = 17 (5)$$

$$8 - 2s = 85$$

$$-2s = 77$$

$$s = -77/2$$
