Name: _____ **Section:** _____

MA 109 Spring 2014

Exam 4 May 5, 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 25 multiple choice questions. There is a possibility for up to 125 points on the exam (but 25 of these count as extra credit). **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. A B C D E
17. A B C D E
18. A B C D E
19. A B C D E
20. A B C D E

For grading use:

Number Correct (out of 25 questions)	**Total Points Earned** (questions worth 5 points each)

Formula Sheet:

Compound Interest: If a principal P_0 is invested at an interest rate r for a period of t years, then the amount $P(t)$ of the investment is given by:

$$P(t) = P_0\left(1 + \frac{r}{n}\right)^{nt} \quad \text{(if compounded } n \text{ times per year)}$$

$$P(t) = P_0\, e^{rt} \quad \text{(if compounded continuously).}$$

Change of Base Formula: Let a and b be two positive numbers with $a, b \neq 1$. If $x > 0$, then:

$$\log_a(x) = \frac{\log_b(x)}{\log_b(a)}$$

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

1. Let

$$f(x) = \begin{cases} x+1 & \text{if } x \leq -3 \\ x^2 - 3 & \text{if } -3 < x \leq 2 \\ -2x + 5 & \text{if } x > 2 \end{cases}$$

Find $f(-4)$.

Choices:

(a) 6

(b) -2

(c) -3

(d) 13

(e) 0

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2. Solve for z.

$$-2z^2 - 6z + 1 = 0$$

Choices:

(a) $\dfrac{-6}{4} \pm \sqrt{11}$

(b) $\dfrac{-3 \pm \sqrt{11}}{2}$

(c) $\dfrac{-6 \pm \sqrt{28}}{4}$

(d) $\dfrac{6 \pm \sqrt{28}}{4}$

(e) $\dfrac{-2 \pm \sqrt{36}}{6}$

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3. Solve for r.

$$(3r - 18)(r^2 - 9) = 0$$

Choices:

(a) The only real solutions are 6 and 3.

(b) The only real solutions are 6 and ± 3.

(c) The only real solutions are 3 and 9.

(d) The are no real solutions.

(e) The only real solutions are ± 3.

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4. For which of the following equations is the number 2 a solution?

Choices:

(a) $4(3 - x) = 12$

(b) $\dfrac{4}{x} + 2 = \dfrac{1}{x - 3}$

(c) $2x^2 - 8 = 0$

(d) $2x^2 + 2x - 8 = 16$

(e) $|2x| = -6$

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

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

Choices:

(a) $x \approx 1.822$

(b) $x \approx -2.112$

(c) $x \approx -0.632$

(d) $x \approx 2.260$

(e) $x \approx 1.175$

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6. Let $f(x) = 3^x$. Which of the following is $f^{-1}(27)$?

Choices:

(a) 27
(b) $\frac{1}{27}$
(c) 3
(d) $\frac{1}{3}$
(e) -1

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7. Solve the inequality $|x - 2| > 5$.

Choices:

(a) $(-3, 7)$
(b) $(-5, 5)$
(c) $(-\infty, -2) \cup (5, \infty)$
(d) $(-\infty, -3) \cup (7, \infty)$
(e) $(-\infty, -3] \cup [7, \infty)$

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8. Find an equation for the line through the points $(-4, 1)$ and $(5, 10)$.

Choices:

(a) $y - 1 = (x + 4)$
(b) $y - 4 = -9(x - 1)$
(c) $y + 5 = -9(x - 10)$
(d) $y + 4 = \frac{1}{9}(x - 5)$
(e) $y - 5 = -\frac{9}{5}(x - 5)$

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9. Solve the following system of equations. $\begin{cases} 4x + 2y = 7 \\ 2x + 2y = 8 \end{cases}$

Choices:

(a) The system has no solution.

(b) The system has infinitely many solutions one of which is $(\frac{1}{2}, \frac{9}{2})$

(c) Every point is a solution to the system.

(d) The only solution is $(-\frac{1}{2}, \frac{9}{2})$.

(e) The only solution is $(-\frac{1}{2}, 3)$.

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10. The number of bacteria in a culture is modeled by the function $n(t) = 100e^{0.5t}$ where t is measured in hours. When will the number of bacteria reach 2500? Round your answer to the nearest tenth of an hour.

Choices:

(a) About 13.2 hours

(b) About 5.9 hours

(c) About 6.4 hours

(d) About 2.8 hours

(e) About 3.7 hours

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11. Let $f(x) = 3x^2 - x - 1$. Find $\dfrac{f(x+h) - f(x)}{h}$ and simplify. (Assume $h \neq 0$.)

Choices:

(a) 1

(b) $3h$

(c) $\dfrac{6xh + 3h^2 - 1}{h}$

(d) $18x + 9h$

(e) $6x + 3h - 1$

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12. Find the quotient $Q(x)$ and the remainder $R(x)$ when $P(x) = 3x^3 - 2x^2 - x + 1$ is divided by $x - 2$.

Choices:

(a) $Q(x) = 3x^2 - 8x + 15, \quad R(x) = -29$

(b) $Q(x) = \frac{1}{3}x^2 + 4x + 7, \quad R(x) = 0$

(c) $Q(x) = 3x^2 + 4x + 9, \quad R(x) = -17$

(d) $Q(x) = 3x^2 + 4x + 7, \quad R(x) = 15$

(e) $Q(x) = 3x^2 + 4x, \quad R(x) = 7x + 1$

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13. Determine the end behavior of the graph of $y = -x^5 + 2x - 6$.

Choices:

(a) $y \to \infty$ as $x \to \infty$ and $y \to \infty$ as $x \to -\infty$

(b) $y \to \infty$ as $x \to \infty$ and $y \to -\infty$ as $x \to -\infty$

(c) $y \to -\infty$ as $x \to \infty$ and $y \to \infty$ as $x \to -\infty$

(d) $y \to -\infty$ as $x \to \infty$ and $y \to -\infty$ as $x \to -\infty$

(e) None of the above.

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14. What is the average rate of change of $f(x) = -5x - 3$ with respect to x from $x = -4$ to $x = -1$?

Choices:

(a) 5

(b) -3

(c) -5

(d) 12

(e) 6

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15. Let $g(x) = \sqrt{x - 4}$. Find the domain of $g(x)$.

Choices:

(a) $(-\infty, -4] \cup [4, \infty)$

(b) $[4, \infty)$

(c) All real numbers.

(d) $(-\infty, 4) \cup (4, \infty)$

(e) $(4, \infty)$

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16. Suppose the graph of $y = f(x)$ is a parabola with vertex $(-1, 3)$ and goes through the points $(0, 0)$ and $(-4, -24)$. Which of the following is an formula for $f(x)$?

Choices:

(a) $f(x) = (x-1)^2 + 3$

(b) $f(x) = x^2 + 3x$

(c) $f(x) = 2x^2 + 4x + 5$

(d) $f(x) = (x+1)(x+4)$

(e) $f(x) = -3(x+1)^2 + 3$

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17. Solve for x.

$$6\log_4(x+5) = 12$$

Choices:

(a) $x = 11$

(b) $x = -4.5$

(c) $x = \sqrt[6]{12}$

(d) $x = 0$

(e) $x = \dfrac{12}{6\log(4)}$

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18. Write $2\log(x) + 3\log(y) - 4\log(z)$ as a single logarithm.

Choices:

(a) $\dfrac{\log(x^2y^3)}{\log(z^4)}$

(b) $\log(x^2 + y^3 - z^4)$

(c) $\log(xyz)$

(d) $\log\left(\dfrac{2x3y}{4z}\right)$

(e) $\log\left(\dfrac{x^2y^3}{z^4}\right)$

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19. Explain how the graph of $g(x) = (x+5)^2 - 8$ is obtained from the graph of $f(x) = x^2$.

Choices:

(a) Shift the graph of f right 5 units and shift up 8 units to obtain the graph of g.

(b) Shift the graph of f left 8 units and shift down 5 units to obtain the graph of g.

(c) Shift the graph of f left 5 units and shift down 8 units to obtain the graph of g.

(d) Shift the graph of f right 5 units and shift down 8 units to obtain the graph of g.

(e) Shift the graph of f right 8 units and shift up 5 units to obtain the graph of g.

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20. If \$2,500 is deposited in a bank account with a yearly interest rate of 4% compounded monthly, how long until the account has doubled? Round answer to the nearest tenth.

Choices:

(a) 10.5 years.

(b) 32.8 years.

(c) 17.4 years.

(d) 2.1 years.

(e) 21.0 years.
