MA 109 — College Algebra Spring 2011
EXAM 4 05/02/2011

Name: _____ **Sec.:** _____

Do not remove this answer 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. For each multiple choice question, you will need to fill in the box corresponding to the correct answer. For example, if (a) is correct, you must write

[a] [b] [c] [d] [e]

Do not circle answers on this page, but please do circle the letter of each correct response in the body of the exam. It is your responsibility to make it CLEAR which response has been chosen. You will not get credit unless the correct answer has been marked on both this page and in the body of the exam.

GOOD LUCK!

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]

For grading use:

Total	
	(out of 90 pts)

Multiple Choice Questions

Show all your work on the page where the question appears.
Clearly mark your answer both on the cover page of this exam
and in the corresponding questions that follow.

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1. Find an equation for the line through the points $(-3, 5)$ and $(4, 13)$.

   Possibilities:

   (a) $y - 13 = -\frac{7}{8}(x - 4)$
   (b) $y - 3 = -\frac{7}{8}(x - 5)$
   (c) $y - 4 = \frac{8}{7}(x - 13)$
   (d) $y - 5 = \frac{8}{7}(x + 3)$
   (e) $y + 5 = \frac{8}{7}(x - 3)$

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2. Let $h(x) = \sqrt{x} + 28$. Find functions $f(x)$ and $g(x)$ such that $h(x) = f(g(x))$.

   Possibilities:

   (a) $f(x) = \sqrt{x}$ and $g(x) = x - 28$
   (b) $f(x) = x^2$ and $g(x) = x + 28$
   (c) $f(x) = x + 28$ and $g(x) = \sqrt{x}$
   (d) $f(x) = \sqrt{x}$ and $g(x) = x + 28$
   (e) $f(x) = x - 28$ and $g(x) = x^2$

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3. Let $f(x) = 7 - 4x^2$. Find $\dfrac{f(x+h) - f(x)}{h}$.

   Possibilities:

   (a) $8x + 4h$
   (b) $-8x - 4h$
   (c) $\dfrac{7}{h} - 4h$
   (d) $\dfrac{-8x^2 - 8xh - 4h^2}{h}$
   (e) $\dfrac{14 - 8x^2 - 8xh - 4h^2}{h}$

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4. Which of the following is a factor of $P(x) = x^4 + 7x^3 + 5x^2 - 31x - 30$?

Possibilities:

(a) $(x - 1)$
(b) $(x - 2)$
(c) $(x - 3)$
(d) $(x - 4)$
(e) $(x - 5)$

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5. The number of bacteria in a culture is modeled by the function $n(t) = 80e^{0.2t}$ where t is measured in hours. When will the number of bacteria reach 3500? Round your answer to the nearest hundredth of an hour.

Possibilities:

(a) About 20.07 hours
(b) About 8.20 hours
(c) About 3.78 hours
(d) About 18.89 hours
(e) About 80.47 hours

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6. Let $f(x) = 4x^9 + 3x^5 - 2x^2 + 7x + 1$. Determine the end behavior of $y = f(x)$.

Possibilities:

(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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7. Solve.

$$3x^2 - 8x + 1 = 0$$

Possibilities:

(a) $\dfrac{8 \pm \sqrt{76}}{6}$

(b) $\dfrac{-8 \pm \sqrt{52}}{6}$

(c) $\dfrac{8 \pm \sqrt{52}}{6}$

(d) $\dfrac{-8 \pm \sqrt{76}}{6}$

(e) $\dfrac{-8}{6} \pm \sqrt{52}$

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8. Find the remainder of the division problem.

$$\frac{x^3 + 1}{x + 4}$$

Possibilities:

(a) -4

(b) $x^2 - 1$

(c) -63

(d) $x^2 + 1$

(e) 65

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9. Suppose you want to graph $5x - 7y + 9 = 0$ on your graphing calculator. What should you enter into your calculator?

Possibilities:

(a) $Y = 9/7 + 5/7x$

(b) $Y = 5/7x$

(c) $Y = 9 + 5x$

(d) $Y = -9/7 - 5/7x$

(e) $Y = -9/5 + 7/5y$

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10. Solve the inequality.

$$\frac{x+8}{x-4} \leq 0$$

Possibilities:

(a) $(-\infty, -8] \cup (4, \infty)$
(b) $[-8, 4]$
(c) $(-8, 4)$
(d) $[-8, 4)$
(e) $(-\infty, -8) \cup (4, \infty)$

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

Possibilities:

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

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12. Solve for x.

$$4\log(x+8) = 16$$

Possibilities:

(a) $x = \dfrac{16}{4 - \log(8)}$
(b) $x = 10^4 - 8$
(c) $x = \dfrac{10^{16}}{4} - 8$
(d) $x = \dfrac{10^{16} - 8}{4}$
(e) $x = \dfrac{16}{4\log(8)}$

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13. Let $P(x) = 5x^{50} + 4x^{40} - 31x^{30} + 3x^{20} + 9$. List all possible rational zeros of $P(x)$ given by the Rational Zeros Theorem (but do not check to see which are actually zeros).

Possibilities:

(a) $\pm 1, \pm 9, \pm 5/9$
(b) $\pm 1, \pm 3, \pm 9, \pm 1/5, \pm 3/5, \pm 9/5$
(c) $\pm 1, \pm 9, \pm 9/5$
(d) $\pm 1, \pm 1/3, \pm 1/9, \pm 5, \pm 5/3, \pm 5/9$
(e) $\pm 1, \pm 3, \pm 9, \pm 5, \pm 5/3, \pm 5/9$

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14. Let $r(x) = \dfrac{x+1}{x+4}$. Find the asymptotes of r.

Possibilities:

(a) The vertical asymptote is $x = 1$ and the horizontal asymptote is $y = -4$
(b) The vertical asymptote is $x = -4$ and the horizontal asymptote is $y = 1$.
(c) The vertical asymptote is $x = -1$ and the horizontal asymptote is $y = -4$.
(d) The vertical asymptote is $x = -1$ and the horizontal asymptote is $y = 1$.
(e) The vertical asymptote is $x = -4$ and the horizontal asymptote is $y = -1$.

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15. Which of the following functions are one-to-one?

$$f(x) = x^2 + 3 \qquad g(x) = x^3 \qquad h(x) = 3x - 9$$

Possibilities:

(a) Only $h(x)$ is one-to-one.
(b) Only $g(x)$ and $h(x)$ are one-to-one.
(c) Only $f(x)$ and $g(x)$ are one-to-one.
(d) None of the functions are one-to-one.
(e) All of the functions are one-to-one.

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16. Explain how the graph of $g(x) = (x+1)^3 - 7$ is obtained from the graph of $f(x) = x^3$.

Possibilities:

(a) Shift right 1 units and shift up 7 units.
(b) Shift right 7 units and shift up 1 units.
(c) Shift left 1 units and shift down 7 units.
(d) Shift left 7 units and shift down 1 units.
(e) Shift right 1 units and shift down 7 units.

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17. How many solutions does the following system of equation have?

$$\begin{cases} 2x + 10y = 14 \\ 4x - 20y = 28 \end{cases}$$

Possibilities:

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

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18. When a high school basketball team charges p dollars per ticket, the total revenue R from ticket sales is given by the formula

$$R(p) = 1600p - 80p^2.$$

What price should the team charge in order to maximize the revenue?

Possibilities:

(a) \$7
(b) \$9
(c) \$10
(d) \$11
(e) \$8

Formula Sheet:

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

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

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

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

$$\boxed{\log_b x = \frac{\log_a x}{\log_a b}}$$