MA 109 — College Algebra Spring 2010
EXAM 4 5/6/2010

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 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	**11.**	a	b	c	d	e
2.	a	b	c	d	e	**12.**	a	b	c	d	e
3.	a	b	c	d	e	**13.**	a	b	c	d	e
4.	a	b	c	d	e	**14.**	a	b	c	d	e
5.	a	b	c	d	e	**15.**	a	b	c	d	e
6.	a	b	c	d	e	**16.**	a	b	c	d	e
7.	a	b	c	d	e	**17.**	a	b	c	d	e
8.	a	b	c	d	e	**18.**	a	b	c	d	e
9.	a	b	c	d	e	**19.**	a	b	c	d	e
10.	a	b	c	d	e	**20.**	a	b	c	d	e

For grading use:

Total	
	(out of 100 pts)

Name: _____

Multiple Choice Questions

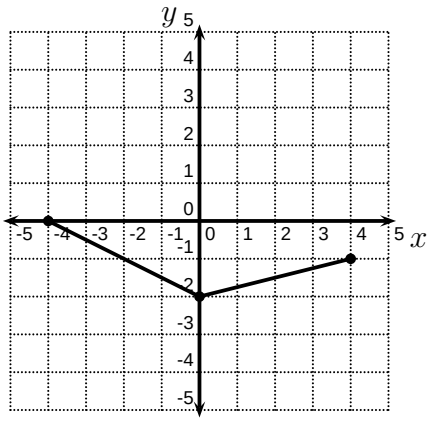
Show all your work on the page where the question appears.
Clearly mark your answer both on the cover page on this exam
and in the corresponding questions that follow.

1. Let $f(x) = 3x - 1$ and $g(x) = x^2$. Find $g(f(x))$.

   Possibilities:

   (a) $9x^2 - 6x + 1$
   (b) $9x^2 - 1$
   (c) $3x^2 - 1$
   (d) $9x^2 + 1$
   (e) $3x^3 - x^2$

2. The graph of $y = f(x)$ is shown below. Find the maximal interval on which f is decreasing.



   Possibilities:

   (a) $[-2, 0]$
   (b) $[0, 4]$
   (c) $[-4, 4]$
   (d) $[-4, 0]$
   (e) Never Decreasing

3. Solve for x.

$$\ln(9x) = 3$$

   Possibilities:

   (a) $\dfrac{3}{2\ln(3)}$
   (b) $3 + 2\ln(3)$
   (c) $e^{1/3}$
   (d) $3 - 2\ln(3)$
   (e) $\dfrac{e^3}{9}$

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

Possibilities:

(a) $(-3, \infty)$
(b) $(3, \infty)$
(c) $[3, \infty)$
(d) $(-\infty, -3)$
(e) $(-\infty, 3]$

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5. Let $f(x) = 2x^2 + 5$. Find $\dfrac{f(x+h) - f(x)}{h}$.

Possibilities:

(a) $\dfrac{2h^2 + 5}{h}$
(b) $4x + 2h$
(c) $\dfrac{4xh + 2h^2 + 10}{h}$
(d) $2h^2 + 5$
(e) $-4x - 2h$

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6. A ball is thrown across a playing field. Its path is given by the equation $y = \dfrac{-11}{4}x^2 + 11x + 9$, where x is the distance (in feet) the ball has travelled horizontally, and y is the height (in feet) of the ball above the ground. What is the maximum height attained by the ball?

Possibilities:

(a) 2 feet
(b) 9 feet
(c) 20 feet
(d) 11 feet
(e) 22 feet

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7. Let $f(x) = |x - 3|$. Find the average rate of change of $f(x)$ between $x = 1$ and $x = 6$.

Possibilities:

(a) 5
(b) 1
(c) $\frac{1}{5}$
(d) 0
(e) $\frac{-1}{5}$

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8. Determine the behavior of $y = \frac{-1}{x - 6}$ as $x \to 6^+$.

Possibilities:

(a) $y \to 1$ as $x \to 6^+$
(b) $y \to \infty$ as $x \to 6^+$
(c) $y \to \frac{1}{12}$ as $x \to 6^+$
(d) $y \to 0$ as $x \to 6^+$
(e) $y \to -\infty$ as $x \to 6^+$

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9. Let $P(x) = x^4 - 2x^3 - 2x^2 - 2x - 3$ Which of the following statements are true?

(I) $(x + 3)$ is a factor of $P(x)$ (II) $(x + 4)$ is a factor of $P(x)$
(III) $(x - 1)$ is a factor of $P(x)$ (IV) $(x + 1)$ is a factor of $P(x)$

Possibilities:

(a) (I), (II), (III), and (IV) are all true.
(b) Only (IV) is true.
(c) Only (I) and (III) are true.
(d) Only (III) is true.
(e) Only (I) and (IV) are true.

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10. Find an equation for the line that is perpendicular to the line $y = \frac{3}{7}x + 3$ and that passes through the point $(5, -16)$.

Possibilities:

(a) $y + 16 = \frac{3}{7}(x - 5)$

(b) $y + 16 = \frac{7}{3}(x - 5)$

(c) $y - 16 = \frac{-7}{3}(x + 5)$

(d) $y - 16 = \frac{3}{7}(x + 5)$

(e) $y + 16 = \frac{-7}{3}(x - 5)$

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11. The function $f(x) = |x - 7|$ is not a one-to-one function. The points $(11, 4)$ and _____ on the graph of f prove that f is not a one-to-one function.

Possibilities:

(a) $(11, -4)$

(b) $(7, 0)$

(c) $(-11, 4)$

(d) $(3, 4)$

(e) $(-11, -4)$

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12. Solve the inequality.

$$(x + 2)(x - 7) \geq 0$$

Possibilities:

(a) $(-\infty, \infty)$

(b) $[-2, 7]$

(c) $(-2, 7)$

(d) $(-\infty, -2) \cup (7, \infty)$

(e) $(-\infty, -2] \cup [7, \infty)$

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13. Find all real solutions or state that there are no solutions.

$$\sqrt{x-9} = x - 11.$$

Possibilities:

(a) $x = 13$

(b) No Solutions

(c) $x = 10$

(d) $x = 13$ or $x = 10$

(e) $x = 9$ or $x = 11$

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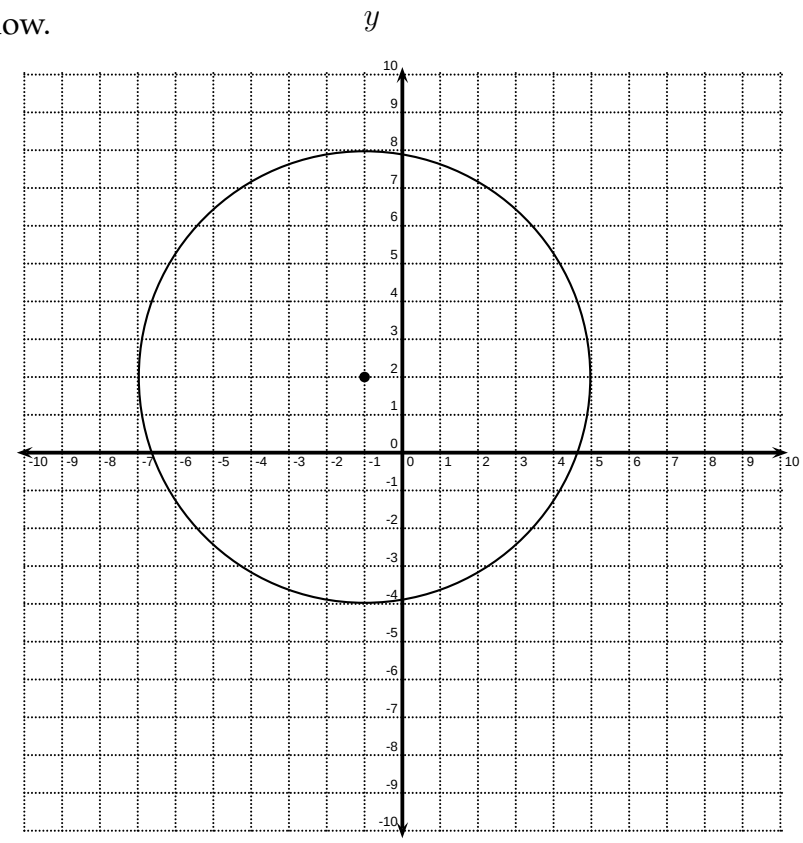
14. Find an equation for the circle shown below.



Possibilities:

(a) $(x-1)^2 - (y+2)^2 = 144$

(b) $(x+1)^2 + (y-2)^2 = 6$

(c) $(x+1)^2 + (y-2)^2 = 36$

(d) $(x-1)^2 + (y+2)^2 = 12$

(e) $(x-1)^2 - (y+2)^2 = 36$

15. Joni invests \$2000 at an interest rate of 4% per year compounded continuously. How much time will it take for the value of the investment to double? Round your answer to the nearest tenth of a year.

Possibilities:

(a) 17.3 years

(b) 8.7 years

(c) 40.2 years

(d) 27.5 years

(e) 34.7 years

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16. Let $f(x) = e^x + 6$. Find $f^{-1}(x)$.

Possibilities:

(a) $f^{-1}(x) = \dfrac{x+6}{e}$

(b) $f^{-1}(x) = \dfrac{x}{e+2}$

(c) $f^{-1}(x) = \dfrac{x-6}{e}$

(d) $f^{-1}(x) = \ln(x-6)$

(e) $f^{-1}(x) = \ln(x+6)$

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17. Let $r(x) = \dfrac{x-4}{x-7}$. Find the horizontal asymptote of $r(x)$.

Possibilities:

(a) $y = 1$

(b) $y = \dfrac{7}{4}$

(c) $y = \dfrac{4}{7}$

(d) $r(x)$ does not have any horizontal asymptotes.

(e) $y = 0$

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18. The number of bacteria in a culture is modeled by the function $n(t) = 40e^{0.4t}$ where t is measured in hours. When will the number of bacteria reach 5500? Round your answer to the nearest hundredth of an hour.

Possibilities:

(a) About 15.30 hours
(b) About 126.46 hours
(c) About 12.31 hours
(d) About 5.35 hours
(e) About 4.92 hours

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19. Express the equation in logarithmic form.

$$6^4 = 1296$$

Possibilities:

(a) $\log_6 4 = 1296$
(b) $\log_6 1296 = 4$
(c) $\log_4 6 = 1296$
(d) $\log_4 1296 = 6$
(e) $\log_{1296} 4 = 6$

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20. How many solutions does the following system of equations have?

$$\begin{cases} 16x + 32y = 64 \\ 20x + 40y = 80 \end{cases}$$

Possibilities:

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

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:

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