MA 109 — College Algebra Spring 2012
EXAM 3 04/11/2012

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. $(-7, 6]$

15. $(3x-5)^2+1.$

16. $(4, \infty)$

17. $-2\ln(2)-4$

18. 3

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.

1. Express the equation in logarithmic form.

$$8^3 = 512$$

Possibilities:

(a) $\log_3(8) = 512$
(b) $\log_8(512) = 3$
(c) $\log_8(3) = 512$
(d) $\log_3(512) = 8$
(e) $\log_{512}(3) = 8$

2. You are going to purchase some memory for your computer. The original price of the memory is x dollars. You have two coupons. The first coupon allows you to take 20% off of the price. The second coupon allows you to deduct \$30 from the price. Suppose that you use the first coupon to take 20% off and then you use the second coupon to deduct \$30 from the already reduced price. Find a formula for the final price P in terms of x.

Possibilities:

(a) $P(x) = 0.80x - 24$
(b) $P(x) = 0.20x - 6$
(c) $P(x) = 0.80x - 30$
(d) $P(x) = 0.80x - 28$
(e) $P(x) = 0.20x - 30$

3. Let $f(x) = 4^x$. Find $f^{-1}(16)$.

Possibilities:

(a) 6
(b) 2
(c) 5
(d) 4
(e) 3

4. If $(-10, 4)$ lies on the graph of $y = f(x)$, find a point on the graph of $y = g(x)$ if $g(x) = 2f(x - 3)$.

Possibilities:

(a) $(-7, 8)$

(b) $(-13, 8)$

(c) $(-7, 2)$

(d) $(-13, 2)$

(e) $(-7, 4)$

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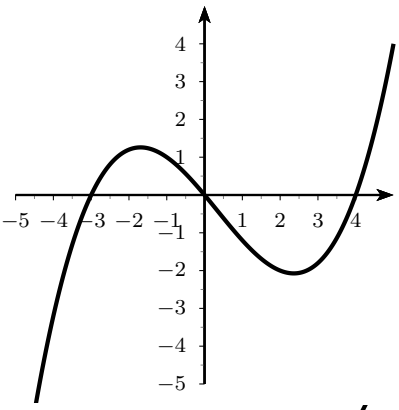
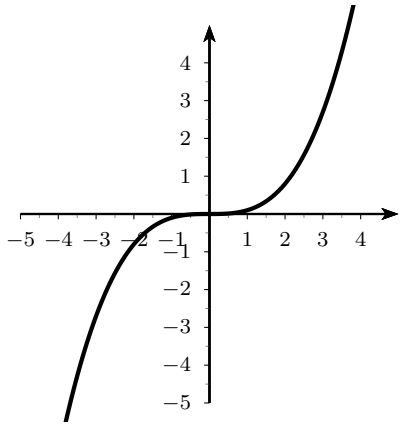
5. Which of the following is the graph of a one-to-one function?

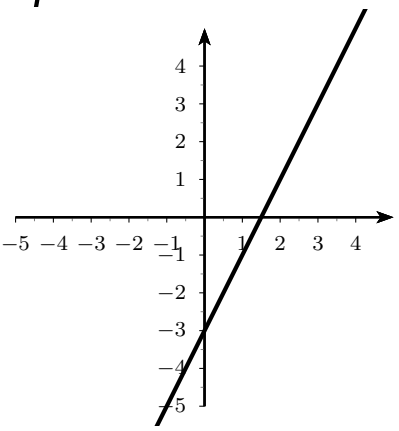
(I)



(II)



(III)



Possibilities:

(a) Only (III) is the graph of a one-to-one function.

(b) (II) and (III) are the graphs of one-to-one functions.

(c) Only (I) is the graph of a one-to-one function.

(d) Only (II) is the graph of a one-to-one function.

(e) (I) and (II) are the graphs of one-to-one functions.

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6. Let $f(x) = 15 + 6x$. Find the average rate of change of $f(x)$ from $x = a$ to $x = a + h$. Assume $h \neq 0$.

Possibilities:

(a) 6

(b) 1

(c) -6

(d) $\dfrac{15 + 6h}{h}$

(e) $\dfrac{12a + 6h}{h}$

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7. Explain how the graph of $g(x) = (x + 5)^3 - 7$ is obtained from the graph of $f(x) = x^3$.

Possibilities:

(a) Shift right 7 units and shift up 5 units.

(b) Shift right 5 units and shift down 7 units.

(c) Shift left 7 units and shift down 5 units.

(d) Shift right 5 units and shift up 7 units.

(e) Shift left 5 units and shift down 7 units.

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8. Expand the given expression using the laws of logarithms.

$$\log_5\left(\frac{x^3y^2}{\sqrt{z}}\right)$$

Possibilities:

(a) $\dfrac{(3\log_5(x))\,(2\log_5(y))}{\dfrac{1}{2}\log_5(z)}$

(b) $3\log_5(x) + 2\log_5(y) - \dfrac{1}{2}\log_5(z)$

(c) $\dfrac{1}{2}\log_5(z) - 3\log_5(x) - 2\log_5(y)$

(d) $\dfrac{(3x)\,(2y)}{\dfrac{1}{2}z}$

(e) $3x + 2y - \dfrac{1}{2}z$

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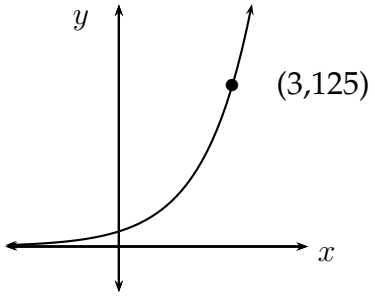
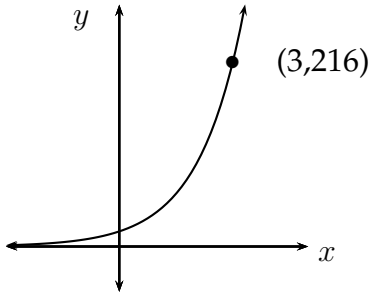
9. Which of the following is the graph of $y = 3^x$?

Possibilities:

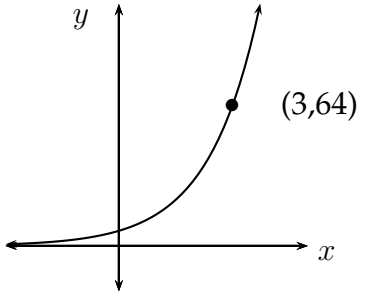
(a)



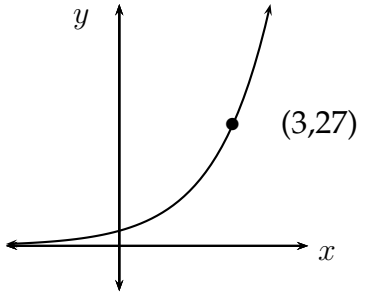
(b)



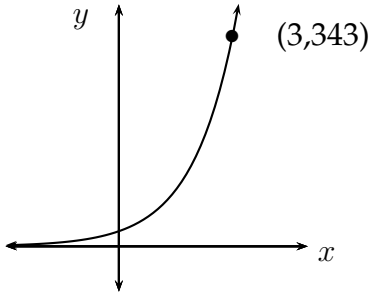
(c)



(d)



(e)



10. Joni invests \$2000 in an account in which the interest is compounded continuously. After 25 years, the account contains \$12000. What is the interest rate on the account? Round your answer to the nearest tenth of a percent.

Possibilities:

(a) 7.8 %

(b) 7.2 %

(c) 5.5 %

(d) 4.4 %

(e) 6.4 %

11. Solve for x.

$$\log(x+7) = 3$$

Possibilities:

(a) $x = 1007$
(b) $x = 350$
(c) $x = 336$
(d) $x = 10$
(e) $x = 993$

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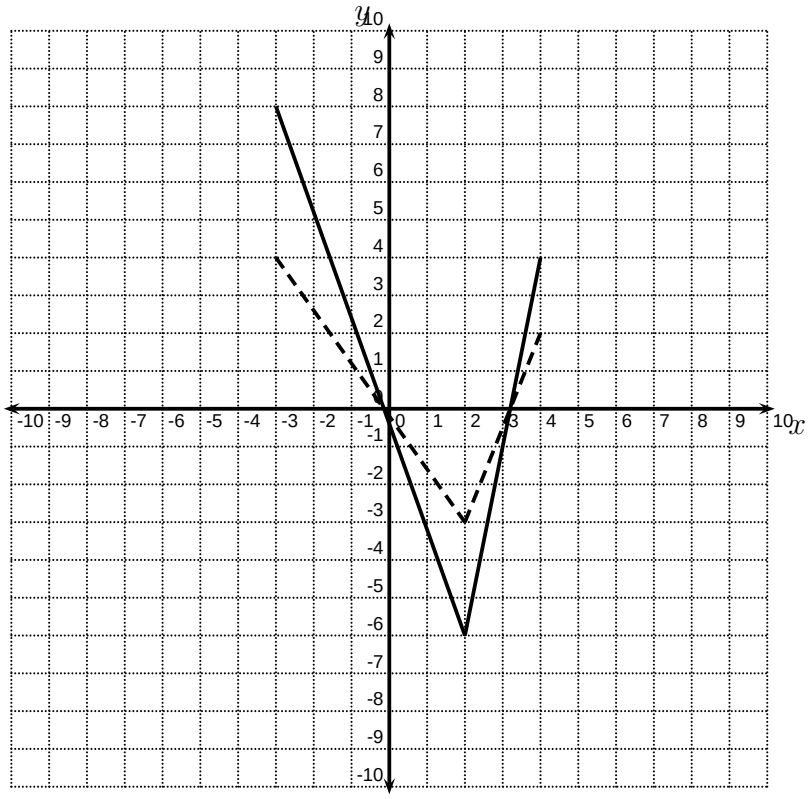
12. In the picture below, the graph of $y = f(x)$ is the solid graph, and the graph of $y = g(x)$ is the dashed graph. Find a formula for $g(x)$.



Possibilities:

(a) $g(x) = f(2x)$
(b) $g(x) = f(x) - 2$
(c) $g(x) = f\left(\frac{1}{2}x\right)$
(d) $g(x) = 2f(x)$
(e) $g(x) = \frac{1}{2}f(x)$

---

13. Let $f(x) = x^2 + 15$. Find the average rate of change of $f(x)$ with respect to x from $x = 0$ to $x = 2$.

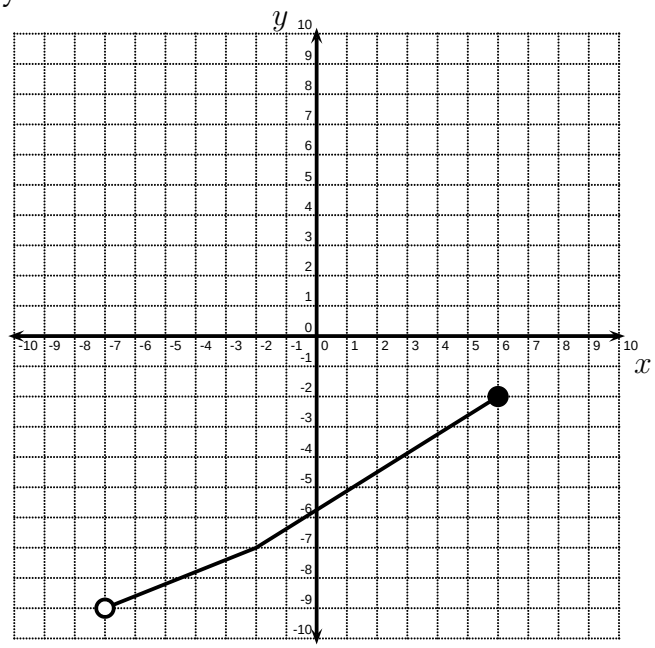
Possibilities:

(a) -2
(b) $\frac{1}{2}$
(c) 4
(d) 2
(e) 3

Short Answer Questions

Clearly write your answers in the spaces provided on the following pages.

14. The graph of the one-to-one function f is shown below. Find the range of f^{-1}. Be sure to write your answer in interval notation.



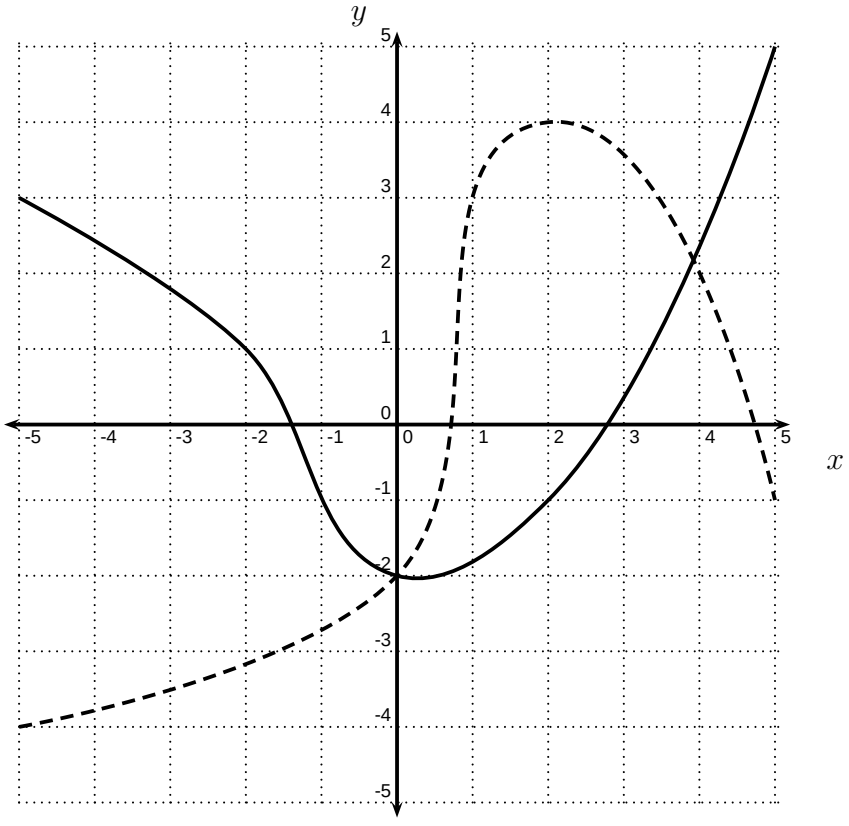
15. Let $f(x) = x^2 + 1$ and $g(x) = 3x - 5$. Find $f(g(x))$.

16. Find the domain of $y = \ln(x - 4)$. Be sure to write your answer in interval notation.

17. Find all real solutions or state that there are NONE.

$$8e^{x+4} = 2.$$

18. In the picture below, the graph of $y = f(x)$ is the solid graph, and the graph of $y = g(x)$ is the dashed graph. Use the graphs to evaluate $(f + g)(2)$.



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:

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