MA 109 — College Algebra Spring 2011
EXAM 3 04/13/2011

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. [ ]

15. [ ]

16. [ ]

17. [ ]

18. [ ]

For grading use:

Total	
	(out of 90 pts)

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:

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

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

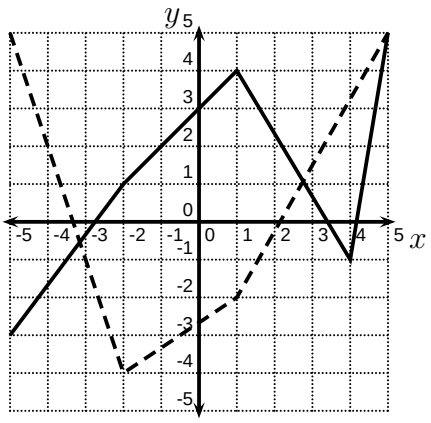
Change of Base Formula: Let a and b be two positive numbers with $a, b \neq 1$. If $x > 0$, then:

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

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. 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 $(f + g)(1)$.



Possibilities:

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

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2. Let $f(x) = \dfrac{x+5}{6}$. Find $f^{-1}(-2)$.

Possibilities:

(a) $\dfrac{3}{4}$
(b) -17
(c) $\dfrac{7}{6}$
(d) 2
(e) $\dfrac{1}{2}$

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3. Let $h(x) = (2x+1)^5$. Find functions $f(x)$ and $g(x)$ such that $h(x) = f(g(x))$.

Possibilities:

(a) $f(x) = 2x + 1$ and $g(x) = x^5$
(b) $f(x) = (2x+1)^3$ and $g(x) = (2x+1)^2$
(c) $f(x) = x^5 + 1$ and $g(x) = 2x$
(d) $f(x) = 2x$ and $g(x) = x^5 + 1$
(e) $f(x) = x^5$ and $g(x) = 2x + 1$

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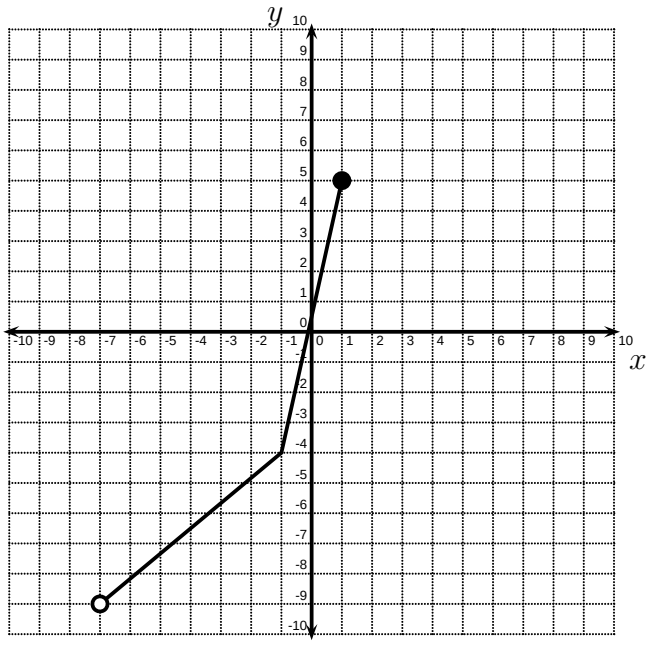
4. The graph of the one-to-one function f is shown below. Find the domain of f^{-1}.



Possibilities:

(a) $(-7, 1]$

(b) $[-7, 1)$

(c) $[-9, 5)$

(d) $[-7, -1) \cup (-1, 1)$

(e) $(-9, 5]$

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5. Let $f(x) = x^2 + 7x$. Find $\dfrac{f(x+h) - f(x)}{h}$ if $h \neq 0$.

Possibilities:

(a) $2x + h + 7$

(b) 1

(c) $\dfrac{2xh + h^2 + 14x + 7h}{h}$

(d) $\dfrac{h^2 + 7h}{h}$

(e) $-2x - h - 7$

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6. You are going to purchase a new sweater. The original price of the sweater is x dollars. You are being cautious with your money, and you have been watching for a good sale. On Wednesday, the store reduced the price of the sweater by 10%. On Saturday, the store reduced the *already reduced clearance price* by an additional 30%. Find a function f that models the final purchase price of sweater as a function of the original sticker price x.

Possibilities:

(a) $f(x) = 1.60x$

(b) $f(x) = 0.40x$

(c) $f(x) = 0.63x$

(d) $f(x) = 0.03x$

(e) $f(x) = 0.60x$

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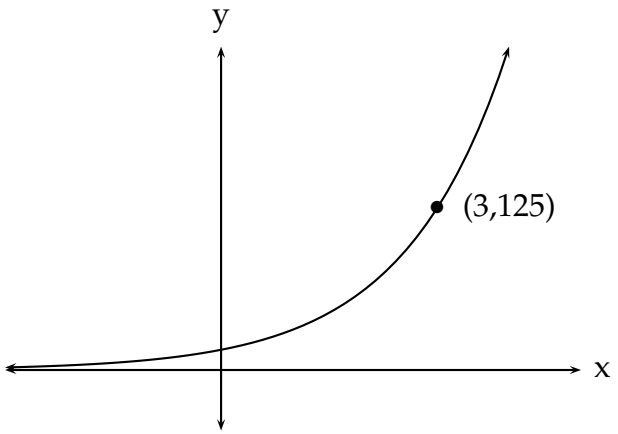
7. The graph of an exponential function, $y = b^x$ is shown below. Find b.



Possibilities:

(a) 4

(b) 6

(c) 8

(d) 5

(e) 7

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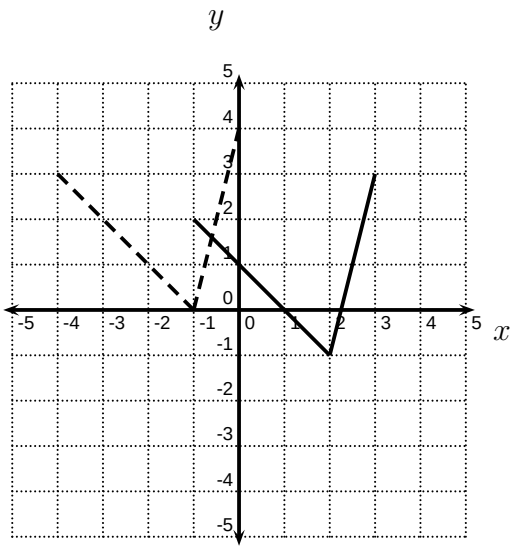
8. In the picture below, the graph of $y = f(x)$ is the solid graph, and the graph of $y = g(x)$ is the dashed graph. Find a formula for $g(x)$.



Possibilities:

(a) $g(x) = f(x - 3) + 1$
(b) $g(x) = f(x + 1) + 3$
(c) $g(x) = f(x + 3) - 1$
(d) $g(x) = f(x + 3) + 1$
(e) $g(x) = f(x - 1) + 3$

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9. If \$3000 is invested at an interest rate of 7% per year compounded quarterly, find the amount of the investment at the end of 11 years.

Possibilities:

(a) \$58885.38
(b) \$6436.29
(c) \$3215.58
(d) \$3630.78
(e) \$3932.39

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10. Express the equation in logarithmic form.

$$6^3 = 216$$

Possibilities:

(a) $\log_{216}(3) = 6$
(b) $\log_3(216) = 6$
(c) $\log_6(216) = 3$
(d) $\log_3(6) = 216$
(e) $\log_6(3) = 216$

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11. If $(6, -2)$ lies on the graph of $f(x)$, find a point on the graph of $g(x)$ if $g(x) = f(2x) + 4$.

Possibilities:

(a) $(10, 4)$
(b) $(3, -6)$
(c) $(12, -6)$
(d) $(12, 2)$
(e) $(3, 2)$

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12. $\log\left(\dfrac{x^{-2}y^5}{z^{11}}\right) =$

Possibilities:

(a) $-2\log(x) + 5\log(y) + 11\log(z)$
(b) $-2\log(x) + 5\log(y) - 11\log(z)$
(c) $(-2\log(x) + 5\log(y))/11\log(z)$
(d) $-2\log(x) - 5\log(y) - 11\log(z)$
(e) $-2\log(x)5\log(y)/11\log(z)$

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13. Solve for x.

$$\log_5(x + 9) = 2$$

Possibilities:

(a) 47
(b) 16
(c) 34
(d) 1
(e) 23

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

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14. Let $f(x) = 2 - x^2$. Find the average rate of change of $f(x)$ from $x = -2$ to $x = 6$.

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15. Find the inverse function of $f(x) = 2x + 5$.

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16. Use a calculator to approximate $\log_{14}(13)$. Your answer should be correct to at least 5 decimal places.

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17. Let $f(x) = \log_4(-13 - x)$. Find the domain of $f(x)$. Be sure to write your answer in interval notation.

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