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

$$\boxed{a}\quad \boxed{b}\quad \boxed{c}\quad \boxed{d}\quad \boxed{e}$$

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. $\log_5(625) = 4$

6. a b c **d** e   16. $x = 1$

7. a **b** c d e   17. $(-3, -7)$

8. **a** b c d e   18. $x = \dfrac{-2}{3}$

9. a **b** c d e   19. $7.2\,\%$

10. a b **c** d e   20. $f^{-1}(x) = 5 + 8x$

For grading use:
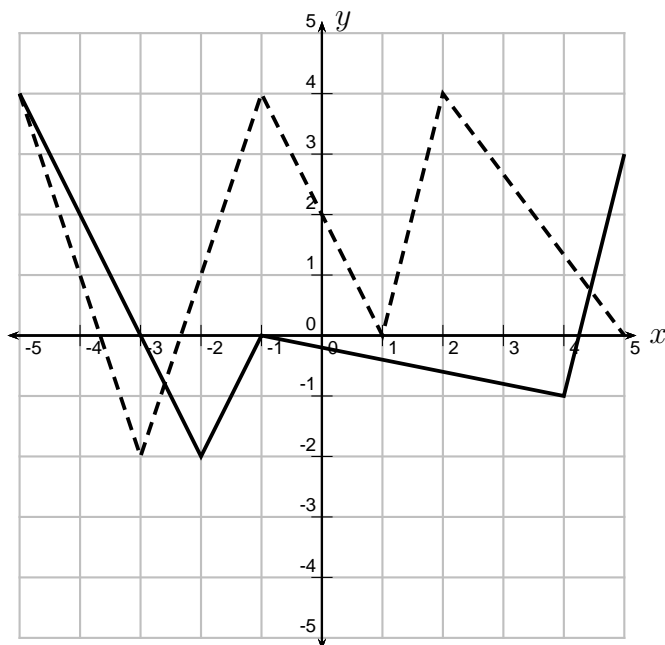
Total	
	(out of 100 pts)

1

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 dotted graph. Use the graph to find $f(g(-3))$.

Possibilities:

(a) -3

(b) 4

(c) -1

(d) -2

(e) -5

2. Owen's parents record his height on his birthday every year. Below is a table of his height on each of his birthdays thus far (including his 0th "birth"day). What is Owen's average rate of change in height with respect to his age from his 1st birthday to his 5th birthday?

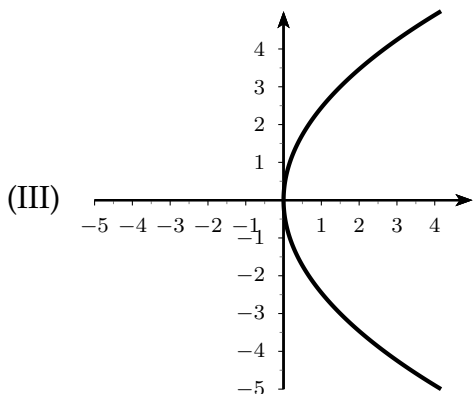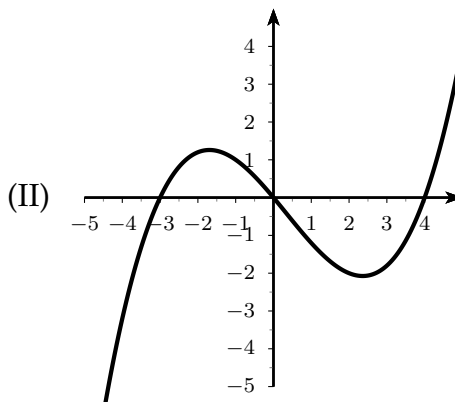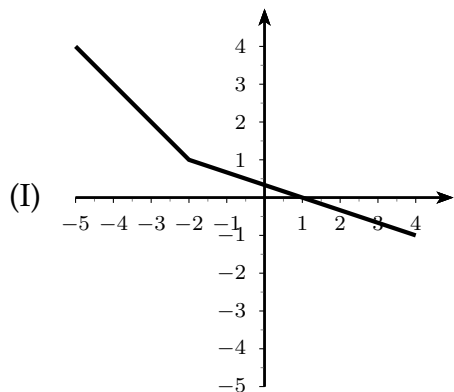| Birthday	0	1	2	3	4	5
Height (in inches)	21.5	29.0	33.0	37.0	39.5	45.0

Possibilities:

(a) 4.700 inches per year

(b) 4.000 inches per year

(c) 6.500 inches per year

(d) 3.250 inches per year

(e) 16.000 inches per year

2

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

(c) (I) and (III) are the graphs of one-to-one functions.

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

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

4. Let $f(x) = 2^x$. Which of the following is NOT true?

Possibilities:

(a) $f(0) = 1$

(b) $f(3) = 6$

(c) $f(4) = 16$

(d) $f(2) = 4$

(e) $f(1) = 2$

5. A manufacturing company makes wooden picnic tables to sell. The company buys the wood for $2.29 per bdft ("bdft" is the unit measure for wood). Each picnic table uses 192 bdft per picnic table. If $c(x)$ is the cost function whose input x is the number of picnic tables and whose output is the cost of the wood to the manufacturing company in dollars, which of the following is a formula for $c(x)$?

Possibilities:

(a) $c(x) = 2.29x$

(b) $c(x) = x + 192$

(c) $c(x) = 439.68 - x$

(d) $c(x) = 2.29$

(e) $c(x) = 439.68x$

6. Solve for t.
$$3^{t-5} = 9.$$

Possibilities:

(a) 11

(b) 3

(c) $\dfrac{19}{5}$

(d) 7

(e) $\dfrac{11}{2}$

7. Let $f(x) = 7x^2 + 11$. Find the average rate of change of $f(x)$ with respect to x from $x = 2$ to $x = 2 + h$.

Possibilities:

(a) $-28 - 7h$

(b) $28 + 7h$

(c) $\dfrac{1}{7(4+h)}$

(d) $7h$

(e) 1

8. A genetic engineer is growing cells in a fermenter. The engineer starts with 200 cells and the cells multiply by splitting in half every 15 minutes. (This means that after 15 minutes, there are 400 cells total.) The new cells have the same DNA as the old ones and thus reproduce at the same rate. How many cells are there after 1.50 hours?

Possibilities:

(a) About 12800 cells

(b) About 1200 cells

(c) About 200 cells

(d) About 566 cells

(e) About 133 cells

9. Carol invests $5000 at an interest rate of 3% per year compounded weekly. Find the amount of the investment at the end of 10 years. Round your answer to the nearest cent. (**HINT:** There are 52 weeks in one year.)

Possibilities:

(a) $23254.43
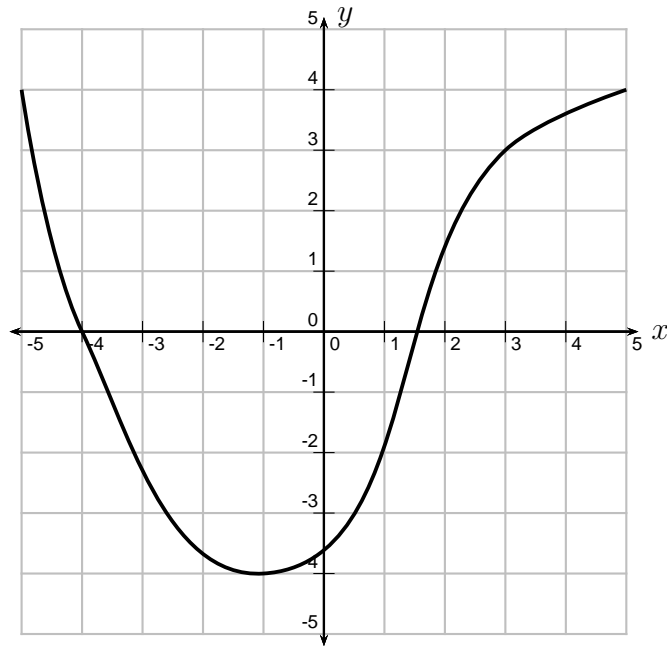
(b) $6748.71

(c) $6824.07

(d) $5028.92

(e) $51522.28

10. Use the laws of logarithms to write the expression as a single logarithm.

$$10 \log(x) + 4 \log(x) - \log(5x - 9)$$

Possibilities:

(a) $\log \left(\dfrac{x^{14}}{-5x + 9} \right)$

(b) $\log \left(\dfrac{x^{40}}{5x - 9} \right)$

(c) $\log \left(\dfrac{x^{14}}{5x - 9} \right)$

(d) $\log \left(\dfrac{14x}{5x - 9} \right)$

(e) $\log \left(x^{10} + x^4 + 5x - 9 \right)$

11. In the picture below, the graph of $y = f(x)$ is the solid graph. Find the average rate of change of f between $x = -4$ and $x = 3$.

Possibilities:

(a) -3

(b) 3

(c) $\dfrac{-7}{3}$

(d) $\dfrac{3}{7}$

(e) $\dfrac{-3}{7}$

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12. Find the domain and range of $f(x) = \ln(x - 2)$.

Possibilities:
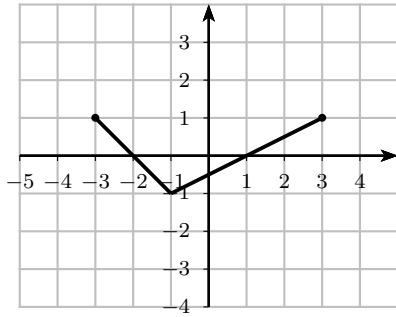
(a) Domain: $(2, \infty)$ Range: $(-\infty, \infty)$

(b) Domain: $(-\infty, \infty)$ Range: $(-\infty, \infty)$

(c) Domain: $(-\infty, \infty)$ Range: $(2, \infty)$

(d) Domain: $(-\infty, \infty)$ Range: $[2, \infty)$

(e) Domain: $[2, \infty)$ Range: $(-\infty, \infty)$

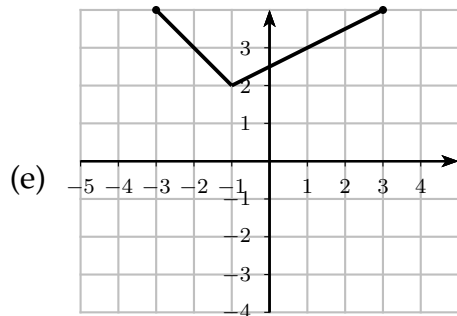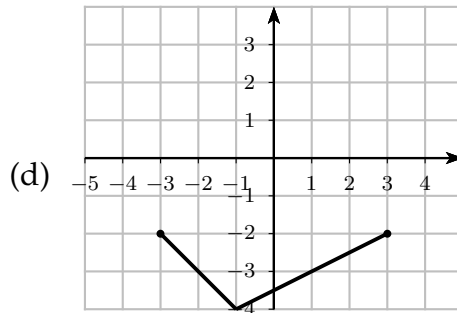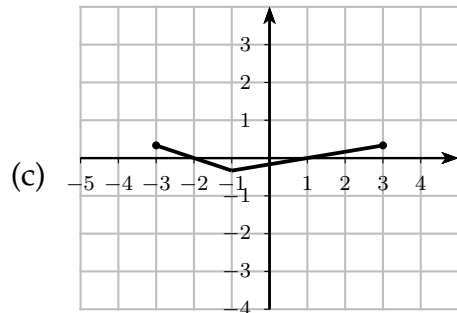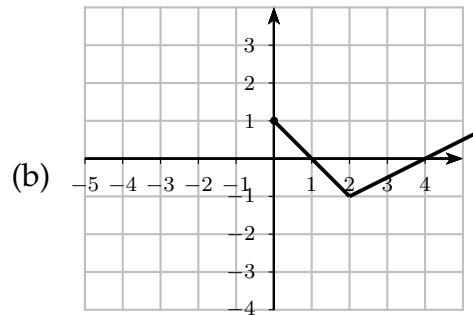13. Let $f(x) = 6^x$. Find $f^{-1}(216)$.
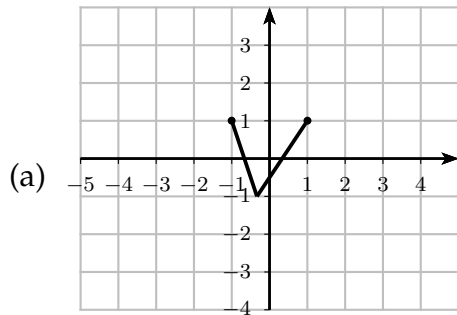
Possibilities:

(a) 6

(b) 1

(c) 4

(d) 5

(e) 3

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14. The graph of $y = f(x)$ is given.

If $g(x) = f(x) - 3$, which of the following is a graph of $y = g(x)$?

Possibilities:

(a)

(b)

(c)

(d)

(e)

15. Express the equation in logarithmic form.

$$5^4 = 625$$

16. Solve for x.

$$\log_3(x + 8) = 2$$

17. Suppose that the graph of $y = T(x)$ contains the point $(-7, -5)$. If $S(x) = T(x - 4) - 2$ find a point that must be on the graph of $y = S(x)$.

18. Let $f(x) = \sqrt{x+4}$ and $g(x) = x - 3$. Find $\left(\dfrac{f}{g}\right)(0)$.

19. Jane invests \$5000 in an account in which the interest is compounded continuously. After 25 years, the account contains \$30000. What is the interest rate on the account? Round your answer to the nearest tenth of a percent.

20. Find the inverse function of $f(x) = \dfrac{x-5}{8}$.

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:

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

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

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

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