

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

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 on this exam
and in the corresponding questions that follow.*

1. Let $r(x) = \frac{(x+4)(x+5)}{x-6}$. Find the vertical asymptote(s) of $r(x)$.

Possibilities:

- (a) $x = 6$
 - (b) $x = \frac{10}{3}$
 - (c) $x = 1$
 - (d) $x = -5$ and $x = -4$
 - (e) $x = 0$
-

2. Alex invests \$4000 at an interest rate of 4% per year compounded continuously. How much time will it take for the value of the investment to triple? Round your answer to the nearest tenth of a year.

Possibilities:

- (a) 12.0 years
 - (b) 34.7 years
 - (c) 40.2 years
 - (d) 27.5 years
 - (e) 17.3 years
-

3. Suppose $(-8, 4)$ lies on the graph of $y = f(x)$. Find a point on the graph of $y = g(x)$ if $g(x) = f(2x) - 3$.

Possibilities:

- (a) $(-16, 1)$
 - (b) $(-11, 2)$
 - (c) $(-4, 7)$
 - (d) $(-5, 8)$
 - (e) $(-4, 1)$
-

4.

$$\log_5 \left(\frac{\sqrt{zy^2}}{x^3} \right) =$$

Possibilities:

- (a) $\frac{(\frac{1}{2}z)(2y)}{3x}$
- (b) $\frac{(\frac{1}{2}\log_5(z))(2\log_5(y))}{3\log_5(x)}$
- (c) $3\log_5(x) - \frac{1}{2}\log_5(z) - 2\log_5(y)$
- (d) $\frac{1}{2}\log_5(z) + 2\log_5(y) - 3\log_5(x)$
- (e) $\frac{1}{2}z + 2y - 3x$

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

$$R(p) = 2400p - 120p^2.$$

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

Possibilities:

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

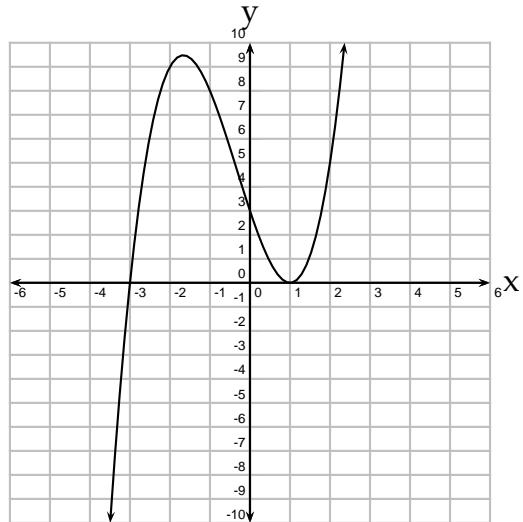
6. How many solutions does the following system of equations have?

$$\begin{cases} 6x + 14y = 24 \\ 9x + 21y = 37 \end{cases}$$

Possibilities:

- (a) No solutions
 - (b) One solution
 - (c) Two solutions
 - (d) Three solutions
 - (e) Infinitely many solutions
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7. The graph of a polynomial is shown below. Which of the following statements are true?

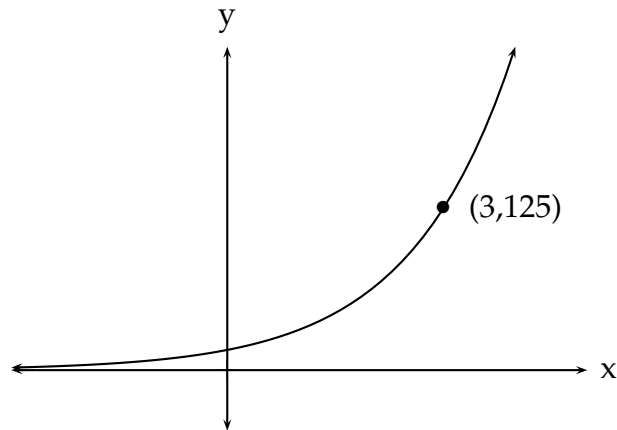


- (I). $(x + 3)$ is a factor of the polynomial.
(II). $(x + 1)$ is a factor of the polynomial.
(III). The degree of the polynomial is odd

Possibilities:

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

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



Possibilities:

- (a) 8
(b) 5
(c) 4
(d) 6
(e) 7

9. Let $f(x) = x^2 + 5x$. Find the average rate of change of $f(x)$ from $x = a$ to $x = a + h$. Assume $h \neq 0$.

Possibilities:

- (a) $-2a - h - 5$
 - (b) $2a + h + 5$
 - (c) 1
 - (d) $\frac{h^2 + 5h}{h}$
 - (e) $\frac{2ah + h^2 + 10a + 5h}{h}$
-

10. Solve the inequality.

$$x^2 - 6x \leq 16$$

Possibilities:

- (a) $[-2, 8]$
 - (b) $(-2, 8)$
 - (c) $(-\infty, -2] \cup [8, \infty)$
 - (d) $[8, \infty)$
 - (e) $(-\infty, -2]$
-

11. Find the intercept(s) of the graph of $y = x^3 - 4x^2 - 45x$.

Possibilities:

- (a) x -intercept: $(0, 0)$
 y -intercepts: $(0, 5)$ and $(0, -9)$
 - (b) x -intercepts: $(0, 0)$, $(-5, 0)$ and $(9, 0)$
 y -intercept: $(0, 0)$
 - (c) x -intercept: $(-45, 0)$
 y -intercepts: $(0, -5)$ and $(0, 9)$
 - (d) x -intercepts: $(0, 0)$, $(-5, 0)$ and $(9, 0)$
 y -intercept: $(0, -45)$
 - (e) x -intercepts: $(-5, 0)$ and $(9, 0)$
 y -intercept: $(0, 0)$
-

12. Solve for x .

$$\log_2(x + 8) = 3$$

Possibilities:

- (a) 19
- (b) -2
- (c) 0
- (d) 17
- (e) 1

13. Let $f(x) = \log_4(12 - x)$. Find the domain of $f(x)$.

Possibilities:

- (a) $(-\infty, 12)$
- (b) $(-\infty, 12]$
- (c) $(4, \infty)$
- (d) $[4, 12)$
- (e) $(-12, 12)$

14. Let $f(x) = \sqrt[3]{x - 2}$. Find $f^{-1}(x)$.

Possibilities:

- (a) $f^{-1}(x) = 2 + x^3$
- (b) $f^{-1}(x) = \frac{2}{3}$
- (c) $f^{-1}(x) = (x + 2)^3$
- (d) $f^{-1}(x) = 3x - 6$
- (e) $f(x)$ is not one-to-one, therefore it does not have an inverse.

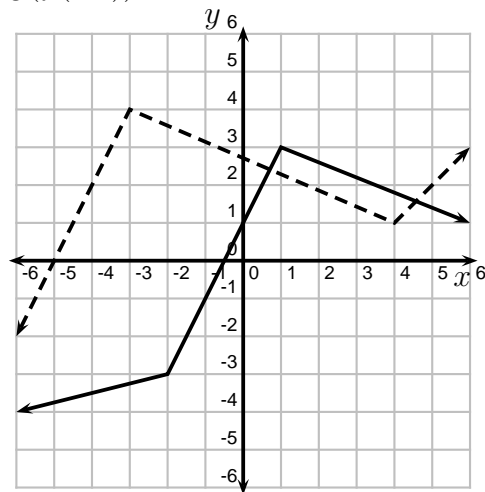
15. Express the equation in logarithmic form.

$$7^3 = 343$$

Possibilities:

- (a) $\log_{343}(3) = 7$
- (b) $\log_3(343) = 7$
- (c) $\log_7(3) = 343$
- (d) $\log_7(343) = 3$
- (e) $\log_3(7) = 343$

16. 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 $g(f(-2))$.



Possibilities:

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

17. How many solutions does the equation have?

$$\frac{3}{x+3} + \frac{7}{x^2+9x+18} = \frac{6}{x+6}$$

Possibilities:

- (a) 4 solutions
- (b) 1 solution
- (c) 3 solutions
- (d) No solutions
- (e) 2 solutions

18. Find an equation for the line through the points $(5, 6)$ and $(14, 7)$.

Possibilities:

(a) $y + 7 = \frac{1}{9}(x + 14)$

(b) $y - 6 = \frac{1}{9}(x - 5)$

(c) $y = \frac{1}{9}(x - 14) - 7$

(d) $y - 6 = \frac{1}{9}x + 14$

(e) $y - 5 = \frac{1}{9}(x - 6)$

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:

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