

Name \_\_\_\_\_ (1 POINT)

Total Possible Points = 200 Points + 10 Points Extra Credits

Note: Show all your work.

1. Simplify:  $\left(\frac{x^3 y^{-7} z^2}{x^{-5} y z^{-4}}\right)^3$  (Assume no variables are equal to zero.) (5 points)

**(Must Show Procedure)**

2. A car is rented for a day. It costs \$45 plus \$.37 per mile. (9 points)

a. Write a formula for a linear function  $f$  that calculates the cost of renting the car when the car is driven  $x$  miles. **(Must Show Procedure)**

\*b. How much does it cost to rent the car for a day and drive 137 miles.

c) If it costs \$63.50 to rent this car for one day, how many miles was it driven?

3. The monthly fees for a condo association can be modeled by the following formula:

$$f(x) = 50x + 100$$

where  $x$  is the number of years since the condo association was built in 1990.

**(Must Show Procedure)**

(9 points)

\*a. What were the monthly fees in 2002?

b. Determine the year when the monthly fees were \$410?

c. Interpret the slope as a rate of change.

4. Find the equation of a line perpendicular to  $-2x - 5y = 10$  and passing through  $(4, -2)$

**(Must Show Procedure)**

(6 points)

5. A student takes out two loans to help pay for college. One loan is at 6% simple interest, and the other is at 7% simple interest. The total amount borrowed is \$7500, and the interest after 1 year for both loans is \$495. Find the amount of each loan.

**(Must Show Procedure)**

(10 points)

6. State the domain of the following functions. (10 points)  
Write your answer in set-builder notation:

a)  $h(x) = \frac{1}{3x-9}$

b)  $f(x) = \frac{1}{x-2}$

c)  $g(x) = \frac{1}{x^2-4}$

d)  $f(x) = x^2 - 3x + 2$

7. Assume \$2000 is deposited in an account that earns 7 % interest compounded annually. (10 points)
- a. Find a formula for  $g(t)$  where  $t$  is time and  $g(t)$  is the amount of money in the account after  $t$  years.
- b. How long will it take for the money to double.

8. Find the inverse of the following functions (10 points)

a.  $f(x) = -3x - 7$

b.  $g(x) = \log_8 x$

9. Assume that the growth of the population of bacteria triples every hour. The colony of bacteria start out with 100 bacteria.

Let  $f(t)$  represent the population of bacteria at time  $t$ , where  **$t$  is in hours.**

(10 points)

a. Find the formula for  $f(t)$

b. Predict when there will be 100,000 bacteria.

10. For problems a through g, algebraically find all solutions, real and non real. Complex solutions should be written in the form  $a + bi$  (5 points each)

a.  $16x^2 - 49 = 0$

d.  $4x^2 + x - 5 = 0$

e.  $x^2 + x + 7 = 0$

f.  $x^2 - x = 42$

g.  $x(-3x + 3) = 2$

Solve for x.

(10 points)

11. 
$$\frac{x}{2x+1} - \frac{1-x}{5x} = \frac{1}{5x}$$

12. The height of a thrown math book is given by the formula  $h(t) = -16t^2 + 32t + 4$   
Where, h(t) is the height measured in feet and t is time measured in seconds. (15 points)

- a. When does the book reach its maximum height?
  
  
  
  
  
  
  
  
  
  
- b. What is the maximum height of the book?
  
  
  
  
  
  
  
  
  
  
- c. How long does it take for the book to hit the ground?

13. Solve the following system by substitution method.

(10 points)

$$\begin{cases} y = x^2 - 3 \\ 2x^2 - y = 1 - 3x \end{cases}$$

14. The following table represents an exponential function of the form  $y = ab^x$ . Find the value of  $a$  and  $b$ , and write the formula for the function in the form  $y = ab^x$ .  
(Please very clearly show of all the mathematical steps) (10 points)

x	y
1	12
2	48
3	192
4	768

15. Let  $f(x) = (7)^x$  Evaluate  $f$  at the indicated values. (15 points)

a.  $f(3)$

b.  $f^{-1}(240)$

c. Find  $x$  when  $f(x) = \frac{1}{343}$

16. Solve  $6x^3 = x^3 + 108$  for  $x$  analytically. (5 points)

17. Some values for the function  $f$  is shown in the table below.

(5 points each)

$x$	0	1	2	3
$f(x)$	3	2	1	0

$x$	0	1	2	3
$g(x)$	1	2	3	0

a. Find  $(f \circ g)(2)$

b. Find  $(g \circ f)(1)$

c. Find  $(f \circ g^{-1})(3)$

d. Find  $(g \circ f^{-1})(2)$

Evaluate the following.

(2.5 points each)

**18 a)** Write the equation  $a^M = c$  in logarithmic form.

**18b)** Write the equation  $\log_7(W) = 3$  in exponential form.

Extra Credits:

19. Perform the indicated operations. Simplify your answers. (6 pts)

c.  $(3 - 5\sqrt{7})(4 + 4\sqrt{7})$

d.  $(3 - 2i)(4 + 7i)$

20. Solve for  $x$  (algebraically). (4 points)

a.  $2x - 1 = \sqrt{7 - x}$

b.  $\sqrt{2x} = x - 4$