

**SHOW YOUR WORK.****PLACE YOUR ANSWERS IN THE BLANKS PROVIDED****100 points possible**

1. Perform each of the following operations and simplify, if possible. (3 points each)

a) 
$$\frac{x+3}{x^2-9} \div \frac{5x+15}{(x-3)^2}$$

Ans \_\_\_\_\_

b) 
$$\frac{5x}{x^2-16} - \frac{2}{x-4}$$

Ans \_\_\_\_\_

c) 
$$\frac{\frac{y}{x^2}}{1 + \frac{1}{x}}$$

Ans \_\_\_\_\_

d) 
$$\sqrt{12x} + \sqrt{45x} + \sqrt{75x}$$

Ans \_\_\_\_\_

2. (2 points) Simplify  $\sqrt[3]{54x^7}$

Ans \_\_\_\_\_

3. (1 point) Write the following expression using radical notation.  $x^{4/5}$

Ans \_\_\_\_\_

4. (2 points) Simplify the following expression and write the result with positive exponents. Assume the

variable represents positive real numbers.  $\frac{\left(x^{1/3}\right)^5}{\left(x^{1/6}\right)^{-2}}$

Ans \_\_\_\_\_

5. (1 point) Rationalize the denominator.  $\frac{4}{\sqrt[3]{9}}$

Ans \_\_\_\_\_

6. (2 points) Write the quotient  $\frac{5}{3-2i}$  in the form  $a + bi$ .

Ans \_\_\_\_\_

7. Given  $f(x) = \frac{4}{x+6}$  and  $g(x) = 6x-1$

a) (1 point) Find the domain of the function  $f(x)$

Ans \_\_\_\_\_

b) (2 points) Find the function composition  $(f \circ g)(x)$ .

Ans \_\_\_\_\_

c) (2 points) Find the inverse function  $g^{-1}(x)$

Ans \_\_\_\_\_

8. Solve the following equations. (3 points each)

a)  $2x^3 + 4x^2 - 126x = 0$

Ans \_\_\_\_\_

b)  $x^2 - 2 = 5x$

Ans \_\_\_\_\_

c)  $2x^2 - 3x + 6 = 0$

Ans \_\_\_\_\_

d)  $1 + \frac{3}{x+1} = \frac{x}{x-1}$

Ans \_\_\_\_\_

e)  $\sqrt{2x-7} + 7 = 10$

Ans \_\_\_\_\_

9. (3 points) A 12-foot ladder is leaning against a wall which is perpendicular to the ground. The base of the ladder is 4 feet from the wall. How high up the wall does the ladder reach? Give the exact answer and an approximation accurate to two decimal places.

Exact \_\_\_\_\_

Approximation \_\_\_\_\_

10. (4 points) Solve the following equation.  $x^4 - x^2 - 20 = 0$

Ans \_\_\_\_\_

11. (4 points) Solve the following inequality. Graph the solution set and write it in interval notation.

$$\frac{x-5}{x+2} \geq 0$$

Graph:

Interval notation \_\_\_\_\_

12. (2 points)  $y$  varies directly as  $x$  and inversely as the square of  $z$ . If  $y = 3$ , when  $x = 8$  and  $z = 2$ , find the variation equation.

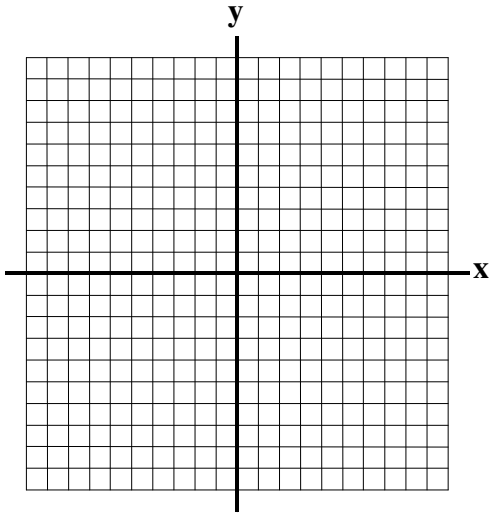
Ans \_\_\_\_\_

13. (1 point) Write  $2^{-3} = \frac{1}{8}$  as a logarithmic equation.

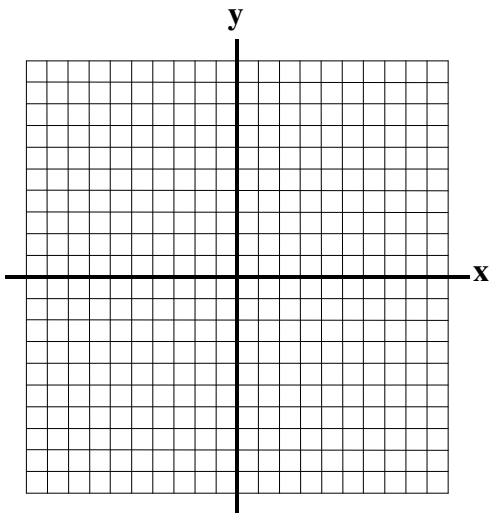
Ans \_\_\_\_\_

14. (5 points) Graph the following function. Identify the vertex and any intercepts.  $f(x) = x^2 + 6x + 5$

Vertex \_\_\_\_\_ Intercepts \_\_\_\_\_



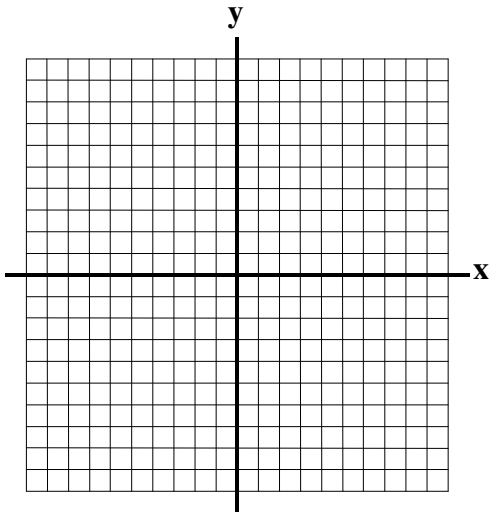
15. (3 points) Graph the following function.  $f(x) = 2^{x-3}$



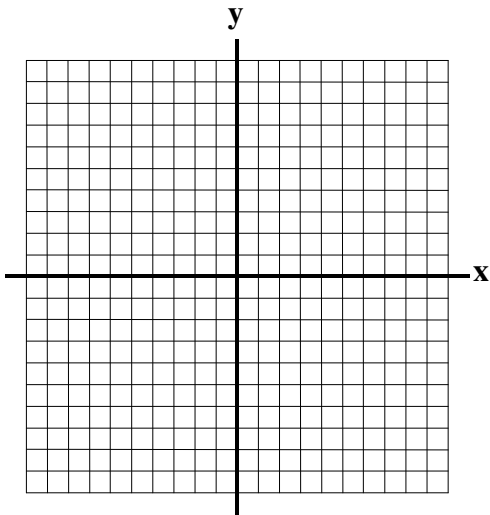
16. (5 points) Find the center and radius of the circle with equation  $x^2 + y^2 - 8x + 4y + 11 = 0$ . Then sketch its graph.

Center \_\_\_\_\_

Radius \_\_\_\_\_



17. (3 points) Graph the following equation.  $\frac{x^2}{16} + \frac{y^2}{49} = 1$



18. (2 points) Write the following expression as a single logarithm.  $3\log_6 2 + 2\log_6 x - 5\log_6 1$ .

Ans \_\_\_\_\_

19. (2 points each) Solve the following equations. Give the exact answer and an approximation accurate to four decimal places.

a)  $e^{3x} = 8$

Exact \_\_\_\_\_

Approximation \_\_\_\_\_

b)  $\log(x+4) = 2.3$

Exact \_\_\_\_\_

Approximation \_\_\_\_\_

20. (3 points) Solve the equation.  $\log_3(x-2) - \log_3 4 = 2$

Ans \_\_\_\_\_

21. (4 points) Find how long it will take an investment of \$2500 to double if it is invested at 3% interest compounded quarterly. Use  $A = P \left(1 + \frac{r}{n}\right)^{nt}$  and round to the nearest tenth.

Ans \_\_\_\_\_

22. (4 points) A truck travels 300 miles through the flatland in the same amount of time that it travels 240 miles through mountains. The rate of the truck is 12 miles per hour slower in the mountains than in the flatland. Find both the flatland rate and the mountain rate.

Flatland \_\_\_\_\_

Mountain \_\_\_\_\_

23. (4 points) It takes one pump 7 hours to fill a pool alone, and it takes a second pump 5 hours to fill the same pool alone. If both pumps work together, how long will it take to fill the pool?

Ans \_\_\_\_\_

24. (4 points) Solve the following system of equations for real number solutions.

$$y = x^2 - 1$$

$$x^2 + y^2 = 13$$

Ans \_\_\_\_\_

25. (5 points) Solve the following system of equations.

$$2x - 2y + z = -12$$

$$-x + 3y - 2z = 11$$

$$3x + y + 4z = 3$$

Ans \_\_\_\_\_