

MATH 1150: Midterm 2 Practice

1. Find the inverse function $g^{-1}(x)$ of the following function:

$$g(x) = \frac{5}{x+4}$$

2. The function $q(x)$ maps input values to output values as shown in the table below. Find $q^{-1}(3)$, if it exists.

x	$q(x)$
-4	5
-2	3
1	0
3	-1
5	4

3. A line passes through the point $(3, 1)$ and is perpendicular to the line with equation $y = -\frac{3}{4}x + 2$. Find the equation of the new line.

4. Find the equation of a circle whose center is at $(6, -2)$ and has a diameter of 10 units.

5. Solve for x in the equation:

$$4(x+1)^2 - 9 = 19$$

6. Solve for x in the equation:

$$x^4 - 8x^2 + 16 = 0$$

7. Identify the domain and range of the exponential function $h(x) = 3 - 2^x$.

8. Identify the domain and range of the logarithmic function $k(x) = \log_3(x - 7) + 5$.

9. Compute $\log_5\left(\frac{1}{25}\right)$, $\log_5(1)$, and $\log_5(25)$.

10. Given $f(x) = \frac{1}{4}\log_6(x + 5)$, find its inverse function $f^{-1}(x)$.

11. A tank is being drained at a constant rate of 4 liters per minute. Initially, it contains 100 liters of water.
- (a) Construct a linear model $V(t)$ for the volume of water remaining after t minutes.
 - (b) Determine how long it takes for the tank to be empty.

12. A toy rocket is launched from the ground, and its height $h(t)$ in meters after t seconds is given by:

$$h(t) = -4(t - 2)^2 + 50.$$

- (a) Find the maximum height achieved by the rocket.
- (b) Determine when the rocket lands back on the ground.

13. Describe the end behavior of the polynomial function:

$$g(x) = -(x + 3)^3(x - 5)^2(x + 1)$$

14. Consider the rational function:

$$r(x) = \frac{2(x - 2)(x + 3)(x + 1)^2(x + 5)^2}{5(x + 3)^2(x + 1)(x - 4)^3}.$$

- (a) Identify the vertical asymptotes.
 - (b) Determine whether a horizontal asymptote exists.
 - (c) Locate any holes in the function.
15. A scientist observes that the population of bacteria in a petri dish doubles every hour. Initially, there are 20 bacteria.
- (a) Express the population as a function of time t in hours.
 - (b) Determine how many bacteria there will be after 5 hours
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