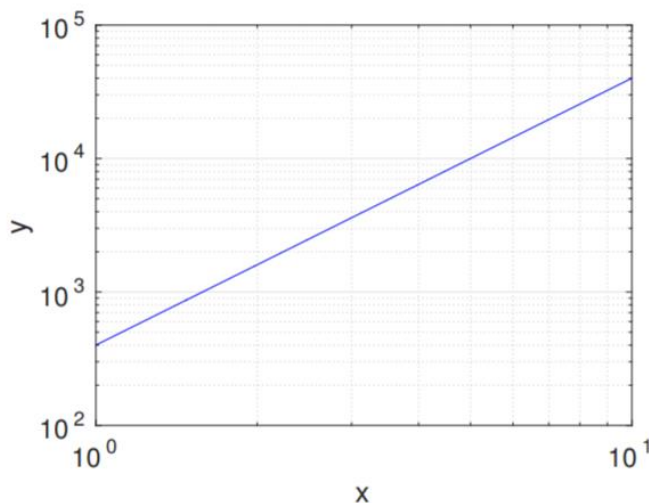


Math 147 Help Session Interview Questions

1. Find the domain of $G(x)$ below.

$$G(x) = \frac{\sqrt{x+10}}{\ln|x-5|}$$

2. Use a log transformation to find a linear relationship between appropriate transformations of x and y if $y = 2x7^{4x}$.
3. Use the semilog plot below to find a functional relationship between x and y . Express your answer in the form $y = ax^b$.



4. Evaluate each of the following limits, if they exist.

- a. $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$
- b. $\lim_{x \rightarrow 3^-} \frac{x}{x^2 - 2x - 3}$
- c. $\lim_{x \rightarrow \infty} (e^{-x} \sin(x))$
- d. $\lim_{x \rightarrow \infty} \left(\frac{\ln x}{\sqrt[3]{x}} \right)$

5. Consider the function $f(x) = \sqrt{x+2}$.

- a. Find $f'(x)$ using the limit definition of the derivative.
- b. Find an equation of the tangent line to the graph of $f(x) = \sqrt{x+2}$ at $x = 14$. Express your answer in slope-intercept form.

6. Suppose that $f(5) = 1$, $f'(5) = 6$, $g(5) = -3$, and $g'(5) = 2$. Find the values of:

- a. $(fg)'(5)$
- b. $\left(\frac{f}{g}\right)'(5)$

7. Differentiate $f(x) = \sin(x^3) + \cos^3(x)$ and simplify completely.

8. Consider the curve defined implicitly by $y = \ln(x^2 + y^2)$.
- Find $y' = \frac{dy}{dx}$
 - Find the equation of the tangent line to the curve at the point $(1, 0)$. Express your answer in slope-intercept form.
9. A ladder 10 feet long rests against a vertical wall. The bottom of the ladder slides away from the wall at a rate of 2 ft/s.
- How fast is the top of the ladder sliding down the wall when the bottom of the ladder is 4 feet from the wall?
 - How fast is the angle between the top of the ladder and the wall changing when the angle is $\frac{\pi}{4}$ radians?

10. Consider the recursive sequence define below. Given that this sequence converges, find the limit.

$$a_{n+1} = \frac{a_n}{a_n + 3}, a_0 = 2$$

11. Find all equilibria (fixed points) of the difference equation (recursion)

$$x_{t+1} = \frac{1}{2}x_t \left(\frac{1}{2} - x_t \right)$$

Use the method of cobwebbing to determine which limit is reached if $x_0 = -1$.

12. Find $f(x)$ if $f''(x) = 12x^2 + 6x - 4$, $f(0) = 4$, and $f(1) = 1$.

13. Find the area under the graph of $y = \frac{1}{x}$ from $x = 1$ to $x = 4$.

14. Evaluate each definite integral.

- $\int_1^9 \frac{1+\sqrt{x}}{\sqrt{x}} dx$
- $\int_0^{\pi/4} \sin(2x) dx$