

1. REVIEW FOR EXAM 1

1. Calculate the limits if the limit exists.

(a)

$$\lim_{\theta \rightarrow 0} \frac{\sin(2t)}{t}.$$

(b)

$$\lim_{x \rightarrow \infty} \frac{ax^3 + bx^2 + d}{-fx^3 + g},$$

where a, b, d, f, g are constants.

(c)

$$\lim_{t \rightarrow \infty} \frac{t^2 - t^4}{t^3}.$$

(d)

$$\lim_{t \rightarrow -3} \frac{|x + 3|}{x + 3}.$$

2. Find a value for the constant k such that the following limit exists:

$$\lim_{x \rightarrow 2} \frac{x^2 + kx - 10}{x - 2}.$$

3. If the size of a bacteria colony doubles every 5 hours, algebraically determine how long it will take for the number of bacteria to be 3 times the original amount?

4. Find the inverse function for

$$f(x) = a + b \ln(cx + d).$$

What is the domain of the given function? Find the asymptotes of this function and of its inverse.

5. Simplify the expression

$$\cos(\arctan(\frac{f}{g})), \quad \text{where } f, g \text{ are constants.}$$

6. Given the function

$$f(x) = \frac{2}{x}.$$

(A) Find the average rate of change over the interval $x = 1$ to $x = 3$.

(B) Calculate $f'(2)$ by using the limit definition of the derivative.

(C) Find the equation of the line tangent to the graph of f at $x=2$.

7. Find the value of k that would make the function continuous.

$$f(x) = \begin{cases} \frac{2x^3-8x^2}{x-4} & \text{if } x \neq 4; \\ k & \text{if } x = 4. \end{cases}$$

8. Draw the graph of a function, f with the given characteristic:

$$f(3) = 5$$

and

$$\lim_{x \rightarrow 3} f(x)$$

does not exist.

9. Find an open interval where the function

$$f(x) = \frac{1}{\cos(x)}$$

is

(a) continuous

(b) not continuous.

10. The cost of producing p articles is given by the function

$$C = f(p) = 120 + 4p.$$

Explain in practical terms what $f^{-1}(500)$ tells you.

11. Find the half-life of a radioactive substance that is reduced by 40% in 30 hours.

12. Determine if the following function is continuous at $x = 1$,

$$g(x) = \begin{cases} \sin(\pi x) + 3 & \text{if } x \leq 1; \\ x^2 + 2 & \text{if } x > 1. \end{cases}$$

13. Given the table

x	$f(x)$	$g(x)$
0	1	2
1	2	3
2	4	1

(a) Find $(f \circ g)(0)$

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

14. Determine if the situation is linear or exponential and then find a formula: A car purchased for 5000 dollar loses 600 dollar in value every year.