



Team Questions

1: Find the slope of the tangent line to the graph of  $y = \ln(xe^x)$  at the point where  $x = 3$ .

2: Evaluate  $\lim_{x \rightarrow 0} (\sin x)^{\cos x}$

3:  $A = \lim_{x \rightarrow 0} \frac{x^3 - x}{x^3 - 4x}$

$B = \lim_{x \rightarrow 0} \frac{\frac{1}{\sqrt{1+x}} - 1}{x}$

$C = \lim_{\theta \rightarrow 0} \frac{\cos \theta \tan \theta}{\theta}$

Find  $8A + \frac{C}{B}$ .

4: Find  $\frac{dy}{dx}$  if  $y = \frac{\sec^7 x}{7} - \frac{\sec^5 x}{5}$ .

5: Determine the values of b and c so that the following function is continuous.

$$f(x) = \begin{cases} x+1, & 1 < x < 3 \\ x^2 + bx + c, & |x-2| \geq 1 \end{cases}$$

6: An object is thrown (straight down) from the top of a 300 ft. building with initial velocity of 30 ft / sec. What is the velocity at one second?

7: A farmer wishes to fence in a rectangular field of 10,000 square feet. The north - south fences will cost \$1.50 per foot, while the east - west fences will cost \$6.00 per foot. Find the dimensions of the field that will minimize the cost.

8: Find an equation of the tangent line to the graph of  $f(x) = \frac{x-1}{x+1}$  when  $x = 1$ .

- 9: The measurement of the edge of a cube is found to be 12 inches, with a possible error of 0.03 inch. Use differentials to approximate the maximum possible error in computing the surface area of the cube.
- 10: Find the average value of  $f(x) = 2x^2 + 3$  on the interval  $[0, 2]$ .
- 11: Find all points at which the graph of  $f(x) = x^3 - 3x$  has horizontal tangent lines.
- 12: A pontoon is to be made by rotating the graph of  $y = 1 - \frac{x^2}{16}$  ( $-4 \leq x \leq 4$ ) about the  $x$ -axis, where  $x$  and  $y$  are measured in feet. Find the volume of the pontoon.
- 13: Find the intervals on which  $f(x) = -x^3 - 6x^2 - 9x - 2$  is increasing.
- 14: Find all points of inflection of  $f(x) = x^3 - 3x^2 - x + 7$ .
- 15: Find the absolute maximum for  $f(x) = \frac{10}{x^2 + 1}$  on the interval  $[-1, 2]$ .