

Calculators and mobile phones are not allowed.

Answer all of the following questions.

1. Find the following limit, if it exists

$$\lim_{x \rightarrow 0} \left(3 + 5|x| \cos \frac{2}{x} \right). \quad (4 \text{ Points})$$

2. Find the vertical and horizontal asymptotes, if any, for the graph of f , where

$$f(x) = \frac{\sqrt{3x^2 + 1}}{2 - x}. \quad (4 \text{ Points})$$

3. Let $f(x) = \begin{cases} 2x + A, & \text{if } x \leq 1, \\ \frac{\sin(x-1)}{x^2 - 1}, & \text{if } x > 1. \end{cases}$

Find the value of A so that f is continuous at $x = 1$. (4 points)

4. Use the definition of the derivative to find $f'(1)$ where $f(x) = \sqrt{5 - 4x}$. (4 points)

5. Let $f(x) = x^{\frac{7}{3}} - 7x^{\frac{1}{3}} + 2$. Find the point(s) on the graph of f at which

(a) the tangent line is horizontal

(b) the graph of f has a vertical tangent line. (4 points)

6. Find an equation of the normal line to the graph of $y = x^2 + \frac{x^2 - 7}{2x + 1}$ at $x = 1$.