NAME   : _____

Class NO. _____

1. Evaluate each limit, provide a detailed calculation to get full credit. Write you final answer in the box.

(1)
$$\lim_{x \to -3} \frac{x^2 - x - 12}{x + 3}$$

(2).
$$\lim_{x \to 0} 2x \ln x$$

(3).
$$\lim_{x \to 0} \frac{2 \sin x}{x}$$

(4).

$$\lim_{x \to 3} \frac{-100}{(x-3)^2}$$

2. Differentiate each function, provide a detailed calculation to get full credit. Write you final answer in the box.
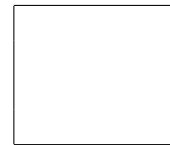
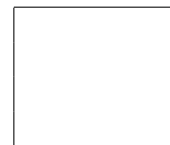(1). $y = \dfrac{x^2 + 4x + 3}{\sqrt{x}}$

(2). $f(x) = 2xe^x$

(3). $y = \sec(tanx) + \cot(x)$

(4). $f(x) = \ln(2 - x - 5x^2)$

3.(1)Find an equation of the tangent line to the curve at the given point

$$y = (1 + 3x)^{10}, \quad (0, 1)$$

(2) Find dy/dx by implicit differentiation.

$$x^3 + 2x^2y + 4y^2 = 6$$

4. Let $f(x) = \dfrac{3x^2}{x^2 - 9}$.
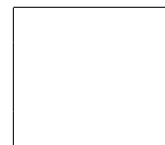
(1) Find the horizontal asymptotes.

(2). Find the vertical asymptotes.

(3) Find f'

(4). Find the critical numbers of f

(5). Find the intervals of increase and the intervals of decrease.

(6). Find the local maximal and minimum values.

(7). Find the second derivative f''

(8) Find the intervals of concavity and the inflection points.

(9) Use the information from parts (1)-(8) to sketch the graph of f.

5. Find all antiderivatives of the following functions.

(1) $f(x) = (x+1)(x-2) + \sin x$

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(2) Evaluate the following definite integral.

$$\int_1^4 3\sqrt{x^3}\,dx$$

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6. If A is the area of a square with edge length x and the area of the square expands at the constant rate of $400cm^2/sec$.. Find the rate at which the edge length x increases when $x = 10cm$.