

★ Answer and mark clearly the questions in the provided answer sheets.
Write down your name and student's ID on the each answer sheet you used.
* **Note:** No points will be given if no arguments are provided for an answer.

$$\text{For your information: } \frac{d}{dx} \left(\frac{f(x)}{g(x)} \right) = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$$

Good Luck!

~~ Yuling ☺

1. (10 points) Find the indicated limit or show it does not exist. If the limiting value is infinite, indicate whether it is ∞ or $-\infty$.

$$(a) \lim_{x \rightarrow 9} \frac{\sqrt{x} - 3}{x - 9} \qquad (b) \lim_{x \rightarrow 0^+} \sqrt{x \left(1 + \frac{1}{x^2} \right)}$$

2. (10 points) Find the value of the constant A so that the function $f(x)$ will be continuous for all x , where

$$f(x) = \begin{cases} \frac{x^2 - 1}{x + 1} & \text{if } x < -1, \\ Ax^2 + x - 3 & \text{if } x \geq -1. \end{cases}$$

3. (10 points) Find all points (both coordinates) on the curve $x^2 + xy + y^2 = 3$ where the tangent line is (a) horizontal and (b) vertical.

4. Find the absolute maximum and absolute minimum (if any) of

(a) (10 points) $f(t) = 3t^5 - 5t^3$ for $-2 \leq t \leq 0$.

(b) (10 points) $f(x) = \ln(4x - x^2)$ for $1 \leq x \leq 3$.

5. (10 points) Find the equation of the tangent line to the graph of $f(x) = x - \ln \sqrt{x}$ at the point where $x = 1$.

6. (40 points) Find the derivative $\frac{dy}{dx}$ or $f'(x)$ where

$$(a) y e^{x-x^2} = x+y \qquad (b) y = \frac{(x^2 + e^{2x})^3 e^{-2x}}{(1+x-x^2)^{2/3}} \qquad (c) f(x) = \frac{e^x + x}{\ln x} \qquad (d) f(x) = 5^{x^2}$$

7. (10 points) Estimate your score. "Correct" if error within 10 points.