Instructor: Yu-Ling Tseng

 \star 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.

Good Luck!

1. (10 points) Find the point(s), if any, at which the graph of

$$f(x) = \frac{x^2 + 8}{x - 1}$$

has a horizontal tangent line.

- 2. (30 points) Find an equation of the tangent line to the given graph at the given point.
 - (a) $f(x) = \sqrt[5]{3x^3 + 4x}$; at (2, 2) (b) $f(x) = \frac{x+1}{\sqrt{2x-3}}$; at (2, 3)
 - (c) $\sin(x) + \cos(2y) = 1$; at $(\frac{\pi}{2}, \frac{\pi}{4})$
- 3. (20 points) (a) Find f'''(u), $f(u) = \frac{1}{(3u-1)^2}$ (b) Find f''(1), $f(x) = (x^3 + x^2)^3$
- 4. (20 points) Find all relative extrema and points of inflection of
 - (a) $g(x) = \sqrt{x} + \frac{4}{\sqrt{x}}$ (b) $g(x) = x\sqrt{x+3}$
- 5. (10 points) You are given $f'(x) = -x^2 + 2x 1$. Find the intervals on which (a) f'(x)is increasing or decreasing, (b) the graph of f is concave upward or concave downward, and (c) find the x-values of the relative extrema and inflection points of f.
- 6. (10 points) Find the absolute extrema of

$$f(x) = \frac{x}{x^2 + 1}$$

on the closed interval [0, 2].