* 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!
$\sim \sim$ Yuling $\ddot{\sim}$

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

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

has a horizontal tangent line.
2. (30 points) Find an equation of the tangent line to the given graph at the given point.
(a) $f(t)=\left(t^{2}-9\right) \sqrt{t+2}$; at $(-1,-8)$
(b) $f(x)=\frac{x+1}{\sqrt{2 x-3}} \quad$; at $(2,3)$
(c) $\sqrt{x y}=x-2 y \quad$; at $(4,1)$
3. (20 points) (a) Find $\frac{d y}{d x}, y=2 \tan ^{2}(4 x) \quad$ (b) Find $f^{\prime \prime}(1), f(x)=\left(x^{3}-2 x\right)^{3}$
4. (20 points) Find all relative extrema and points of inflection of
(a) $g(x)=(x+2)(x+5)^{2}$
(b) $f(x)=\frac{4}{1+x^{2}}$
5. (10 points) You are given $f^{\prime}(x)=-x^{2}+2 x-1$. Find the intervals on which (a) $f^{\prime}(x)$ 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 $[0,2]$.

