Name _____ **Problem Set 3**

"The free response problem sets are work, but they really don't take that long. They are probably the most useful thing that prepares you most for the AP test." A 2019 Nerd

FR1. 1994 – AB 1 **(No Calculator)**

Let $f(x)$ be the function given by $f(x) = 3x^4 + x^3 - 21x^2$.

a) Write an equation of the line tangent to the graph of $f(x)$ at the point $(1,-17)$.

b) At which $x-$value(s) does $f(x)$ attain a relative minimum? Justify your answer.

c) Find the $x-$coordinate of each point of inflection on the graph of $f(x)$. Explain your reasoning.

FR2. 1992 – AB 4 **(No Calculator)**

Consider the curve defined by the equation $y + \cos y = x + 2$ for $0 \le y \le 2\pi$.

a) Find $\frac{dy}{dx}$ in terms of y.

b) Find the value of x in which there is a vertical tangent to the curve.

c) Find $\frac{d^2y}{dx^2}$ in terms of y.

MC1. If $f(x)=\sin^2(3-x)$, then $f'(0)$

(A) $-2\cos 3$ (B) $-2\sin 3\cos 3$ (C) $6\cos 3$ (D) $2\sin 3\cos 3$

MC2. A particle moves along the $x-$axis such that at time $t\geq 0$ its position is given by $x(t)=t^3-4t^2+5t-53$. At what time is the particle at rest (when its velocity is zero)?

(A) $t=1$ only (B) $t=1$ and $t=\frac{5}{3}$ (C) $t=3$ only (D) $t=1$ and t = 3

MC3.

$$f(x)=\begin{cases}2x-2 & \text{for } x<3\\ 2x-4 & \text{for } x\geq 3\end{cases}$$

Let f be the piecewise-linear function defined above. Which of the following statements are true?

I. $\lim\limits_{h\to 0^-}\dfrac{f(3+h)-f(3)}{h}=2$

II. $\lim\limits_{h\to 0^+}\dfrac{f(3+h)-f(3)}{h}=2$

III. $f'(3)=2$

(A) None

(B) II only

(C) I and II only

(D) I, II, and III