Name _____ **Problem Set 5**

"At the end of Term 1, you'll be doing Free Response problem sets. Do them! They get you ready and acclimated to what the AP test looks and feels like." A 2019 Nerd

FR1. 1990 – AB 4 **(Calculator)**

The radius *r* of a sphere is increasing at a constant rate of 0.05 centimeters per second. $V = \frac{4}{3}\pi r^3$

a) At the time when the radius is 10 centimeters, what is the rate of increase of its volume with respect to time?

b) At the time when the volume of the sphere is 36π cubic centimeters, what is the rate of increase of the area of a cross section with respect to time through the center of the sphere? (Cross section = area of circle)

c) At the time when the volume and the radius are increasing at the same rate, what is the radius?

FR2. 1982 – AB 5 **(No Calculator)**

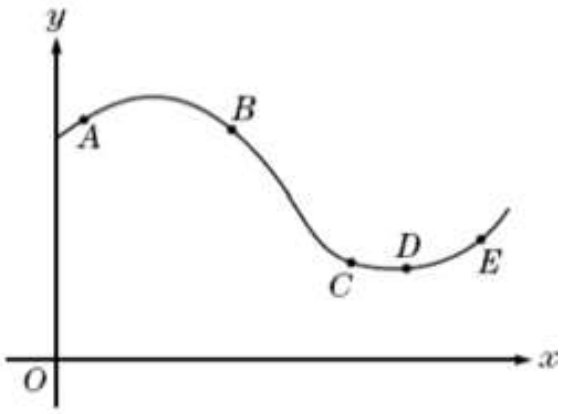
Let $f(x)$ be the function defined by $f(x) = (x^2 + 1)e^x$ for all x such that $[-5, 5]$.

a) For what value of x does $f(x)$ reach its absolute maximum? Justify you answers.

b) Find the x – coordinates of all points of inflection of $f(x)$. Justify your answers.

MC1. At which of the five points on the graph in the figure at the right are $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ both positive ?

(A) A
(B) B
(C) C
(D) D
(E) E



MC2. For time $t \geq 0$, the velocity of a particle moving along the x-axis is given by $v(t) = (t-5)(t-2)^2$. At what values of t is the acceleration of the particle equal to 0?

(A) 2 only

(B) 4 only

(C) 2 and 4

(D) 2 and 5

MC3.

x	2	5	7	8
$f(x)$	10	30	40	20

The function f is continuous on the closed interval $[2,8]$ and has values that are given in the table above. Using the subintervals $[2,5]$, $[5,7]$, and $[7,8]$, what is the trapezoidal approximation of $\int_2^8 f(x)\,dx$?

(A) 130 (B) 160 (C) 190 (D) 210

MC4. $\int \sec^2 x\,dx =$

(A) $2\sec^2 x \tan x + C$ (B) $\frac{1}{3}\sec^3 x + C$ (C) $\cos^2 x + C$ (D) $\tan x + C$