Name______________________________________ Date___________ Obscure Constellation____________

AP Calculus TEST: 2.1 - 2.10 (not including LOG DIFF), NO CALCULATOR

Part Eins: Vielen choices—Put the correct CAPITAL letter in the space to the left of each question.

_____1. What is the slope of the line tangent to the curve $y = \arctan(4x)$ at the point at which $x = \frac{1}{4}$?

(A) 2 (B) $\frac{1}{2}$ (C) 0 (D) $-\frac{1}{2}$ (E) -2

_____2. In the *xy*-plane, the line $x + y = k$, where *k* is a constant, is tangent to the graph of $y = x^2 + 3x + 1$. What is the value of *k*?

(A) -3 (B) -2 (C) -1 (D) 0 (E) 1

_____3. $\frac{d}{dx}\left[\cos^2\left(x^3\right)\right] =$

(A) $6x^2 \sin\left(x^3\right)\cos\left(x^3\right)$ (B) $6x^2 \cos\left(x^3\right)$ (C) $\sin^2\left(x^3\right)$ (D) $-6x^2 \sin\left(x^3\right)\cos\left(x^3\right)$ (E) $-2\sin\left(x^3\right)\cos\left(x^3\right)$

_____4. An equation of the line tangent to the graph of $y = \frac{2x+3}{3x-2}$ at the point $(1,5)$ is

(A) $13x - y = 8$ (B) $13x + y = 18$ (C) $x - 13y = 64$ (D) $x + 13y = 66$ (E) $-2x + 3y = 13$

_____5. If $f(x) = \ln\left(x + 4 + e^{-3x}\right)$, then $f'(0)$ is

(A) $-\frac{2}{5}$ (B) $\frac{1}{5}$ (C) $\frac{1}{4}$ (D) $\frac{2}{5}$ (E) nonexistent

_____6. If $y = x^2 \sin(2x)$, then $\frac{dy}{dx} =$

(A) $2x\cos(2x)$ (B) $4x\cos(2x)$ (C) $2x\left[\sin(2x) + \cos(2x)\right]$

(D) $2x\left[\sin(2x) - x\cos(2x)\right]$ (E) $2x\left[\sin(2x) + x\cos(2x)\right]$

_____7. The $\lim_{h \to 0} \frac{\tan 3(x+h) - \tan 3x}{h}$ is

(A) 0 (B) $3\sec^2(3x)$ (C) $\sec^2(3x)$ (D) $3\cot(3x)$ (E) nonexistent

_____8. What is the slope of the line tangent to the curve $3y^2 - 2x^2 = 6 - 2xy$ at the point $(3,2)$?

(A) 0 (B) $\frac{4}{9}$ (C) $\frac{7}{9}$ (D) $\frac{6}{7}$ (E) $\frac{5}{3}$

_____9. Let f be the function defined by $f(x) = x^3 + x$. If $g(f(x)) = x = f(g(x))$ and $g(2) = 1$, what is the value of $g'(2)$?

(A) $\frac{1}{13}$ (B) $\frac{1}{4}$ (C) $\frac{7}{4}$ (D) 4 (E) 13

Part Los Dos: Frei Response.

10. (1992 AB4/BC1) Consider the curve defined by the equation $y + \cos y = x + 1$, for $0 \le y \le 2\pi$.

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

(b) Write an equation for each vertical tangent to the curve. Show the work that leads to your answer.

(c) Show that $\dfrac{d^2y}{dx^2} = \dfrac{\cos y}{(1-\sin y)^3}$, then find the values of y for which $\dfrac{d^2y}{dx^2} < 0$