Name_____ Date_____ Favorite flavor of Strawberry_____

AP Calculus TEST: 2.1 - 2.9 **NO CALCULATOR**

Part I: Mulitple Choice—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 $y = \operatorname{arccot}(5x)$ at the point at which $x = \frac{1}{10}$?

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

_____2. If $f(x) = 3x^5 - 4x^4 + 7x^3 - e^x$, what is $\lim_{h\to 0} \frac{f^{(5)}(0+h) - f^{(5)}(0)}{h}$?

(A) 1 (B) -1 (C) 359 (D) 361 (E) 0

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

(A) $6e^{3x}\sin\left(e^{3x}\right)\cos\left(e^{3x}\right)$ (B) $2e^{3x}\sin\left(e^{3x}\right)\cos^2\left(e^{3x}\right)$ (C) $6e^{3x}\sin\left(e^{3x}\right)\cos^2\left(e^{3x}\right)$

(D) $3e^{3x}\cos^2\left(e^{3x}\right)$ (E) $2e^{3x}\cos^2\left(e^{3x}\right)$

_____4. If $k(j(x)) = x = j(k(x))$, and if $k(-4) = 3$, $k(1) = -4$, $k'(-4) = -5$, $k'(1) = \frac{2}{5}$, find $j'(-4)$.

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

_____5. If $f(x) = \frac{3}{\ln 4}\cdot 2^x$, then $f'(4) =$

(A) 8 (B) 12 (C) 24 (D) $\frac{48}{\ln 4}$ (E) $\frac{48}{\ln 2}$

_____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. If $\lim_{h\to 0}\frac{\arcsin(a+h)-\arcsin a}{h} = 2$ for some constant $a > 0$, then $a =$

(A) 0 (B) $\frac{1}{2}$ (C) $\frac{\sqrt{2}}{2}$ (D) $\frac{\sqrt{3}}{2}$ (E) 1

_____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 $f(x) = 3x^5 + 2x^3 + 10x - 11$. Find $\left(f^{-1}\right)'\left(f(1)\right)$.

(A) –31 (B) 31 (C) $-\frac{1}{31}$ (D) $\frac{1}{31}$ (E) $\frac{11}{4}$

_____ 10. Find the *x*-values for which the graph of $2x^2 + 3xy + \frac{1}{2}y^2 = -5$ has vertical tangent lines.

I. $x = \sqrt{2}$

II. $x = -\sqrt{2}$

III. 0

(A) I only (B) II only (C) III only (D) I and II only (E) I, II, and III

Part II: Frei Response.

11. Consider the curve given by $6 + x^3 y = xy^2$

(a) Show that $\frac{dy}{dx} = \frac{y^2 - 3x^2 y}{x^3 - 2xy}$

(b) Find every point(s) on the graph of the curve that has an x-coordinate of 1, then write an equation for the tangent line at every/each of these point(s).

(c) The graph of the curve has vertical tangent lines. Find the x-coordinate of each of these vertical tangent lines. Show the work that leads to your answer.