

Name _____ Date _____ Favorite Polka Song _____
AP Calculus TEST: 2.1-2.8, NO CALCULATOR

Part I: Multiple Choice—Put the correct CAPITAL letter in the space to the left of each question.

____ 1. For $x^2y + \sec y = 8$, what is $\frac{dy}{dx}$?

- (A) $-2xy(x^2 \sec y \tan y)$ (B) $\frac{x^2 y}{\sec y \tan y}$ (C) $\frac{-2xy}{x^2 + \sec y \tan y}$ (D) $\frac{-2xy}{x^2 - \sec y \tan y}$

____ 2. What are the y coordinates of the points where $y^3 + x^2 + 30y^2 = 4x + 3$ has vertical tangents?

- (A) $y = 0$ and $y = -20$ (B) $y = 2$ and $y = -20$ (C) $y = 0$ and $y = 2$ (D) $y = -20$

____ 3. Given $xy^2 = 4$, what is the value of $\frac{d^2y}{dx^2}$ at the point $(1, 2)$?

- (A) $\frac{3}{4}$ (B) $\frac{3}{2}$ (C) 1 (D) $\frac{1}{2}$

____ 4. $\lim_{h \rightarrow 0} \frac{\left[4\cos^4(x+h) + 3\sin(x+h)\right] - \left[4\cos^4 x + 3\sin x\right]}{h} =$
(A) $16\cos^3 x \sin x + 3\cos x$ (B) $-4\cos^3 x \sin x + 3\cos x$
(C) $-16\cos^3 x + 3\cos x$ (D) $-16\cos^3 x \sin x + 3\cos x$

____ 5. What is the equation of the normal line to the graph of $y = \cot x$ at the point where $x = \frac{\pi}{2}$?

- (A) $y - 1 = -x + \frac{\pi}{2}$ (B) $y = \frac{\pi}{2}x - 1$ (C) $y = -x + \frac{\pi}{2}$ (D) $y = x - \frac{\pi}{2}$

____ 6. What is the derivative of $\frac{4x^2 - 3x + 7}{5x}$?

- (A) $\frac{4x^2 + 7}{25x^2}$ (B) $\frac{4x^2 - 7}{5x^2}$ (C) $\frac{7 - 4x^2}{5x^2}$ (D) $\frac{4x - 8}{25x^2}$

____ 7. If $f(x) = \sqrt{6 \sin x + 9}$, then $f'(0) =$

- (A) $\frac{1}{2\sqrt{3}}$ (B) 0 (C) 1 (D) $\frac{\sqrt{3}}{6}$

____ 8. If $y = \arctan\left(\frac{x}{2}\right)$, then $\frac{dy}{dx} =$

- (A) $\frac{2}{x^2 + 4}$ (B) $\frac{1}{2 + x^2}$ (C) $\frac{4}{4 + x^2}$ (D) $\frac{4}{2 + x^2}$

____ 9. If $g(x) = \sin^{-1}(x) - \sqrt{1-x^2}$, then $g'(x) =$

- (A) $\frac{1}{2\sqrt{1-x^2}}$ (B) $\frac{2}{\sqrt{1-x^2}}$ (C) $\frac{1+x}{\sqrt{1-x^2}}$ (D) $\frac{x^2}{\sqrt{1-x^2}}$

____ 10. The position of an object moving along a horizontal line at time t is described by the function $x(t) = -(t^2 - 2t + 4)(t^3 - 2t)$. What is the object's velocity at time $t = 1$?

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

____ 11. Given $f(x) = x^3 - 3x^2 + 2x - 7$ and $f(g(x)) = x = g(f(x))$, what is $g'(f(3))$?

- (A) $-\frac{1}{11}$ (B) 11 (C) $\frac{1}{11}$ (D) -11

Part II: Free Response—Show all work in a clear, concise, cogent, and complete manner

12. The table below gives values of the differentiable functions $f(x)$ & $g(x)$ and their derivatives at selected values of x .

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	8	-2	6	-3
2	-1	-5	4	6
4	0	4	2	k

(a) If the function $h(x)$ is given by $h(x) = \frac{f(x)+g(x)}{g(x)}$, find $h'(1)$.

(b) If the function $P(x)$ is given by $P(x) = f(x)g(x)$, find the difference between the instantaneous rate of change of $P(x)$ at $x=2$ and the average rate of change of $P(x)$ between $x=1$ and $x=2$.

(c) If $R(x) = \sqrt{x} \cdot g(x)$ and $R'(4) = \pi$, find the value of k .