Name_____ Date_____ Santa's Hat Size_____

AP Calculus TEST: 2.1 - 2.10, NO CALCULATOR

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

_____1. If $f(x)=\sec^{-1}(x)$, what is $\lim_{h\to 0}\dfrac{f(-2+h)-f(-2)}{h}$?

(A) DNE (B) $\dfrac{-1}{\sqrt{3}}$ (C) $\dfrac{1}{\sqrt{3}}$ (D) $\dfrac{1}{2\sqrt{3}}$ (E) $\dfrac{-1}{2\sqrt{3}}$

_____2. $\dfrac{d}{dx}\left[(\sin x)^x\right]=$ (A) $\ln(\sin x)+x\cot x$ (B) $\left(\ln(\sin x)+x\cot x\right)(\sin x)^x$

(C) $\left(\ln(\sin x)+\cot x\right)(\sin x)^x$ (D) $x(\sin x)^{x-1}$ (E) $\ln(\sin x)\cdot\cos x\cdot(\sin x)^x$

_____3. $\dfrac{d}{dx}\left[5^{2x}+\log_5(2x)\right]=$

(A) $\ln 25\cdot 5^{2x}+\dfrac{1}{x\ln 5}$ (B) $\ln 5\cdot 5^{2x}+\dfrac{1}{x\ln 5}$ (C) $\ln 25\cdot 5^{2x}+\dfrac{2}{x\ln 5}$

(D) $\ln 5\cdot 5^{2x}+\dfrac{1}{2x\ln 5}$ (E) $\ln 25\cdot 5^{2x}+\dfrac{1}{2x\ln 5}$

_____4. What is the slope of the graph of $xy^2+x^2y=2$ at the point $(1,1)$?

(A) -1 (B) 1 (C) $\dfrac{2}{3}$ (D) $\dfrac{-2}{3}$ (E) 0

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

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

_____6. If $f(x)=2\sin x\cos x$, what is $f'(x)$?

(A) $-2\cos x\sin x$ (B) $-2\cos^2 x$ (C) $-2\sin^2 x$ (D) $\cos(2x)$ (E) $2\cos(2x)$

_____7. At what value of x does the graph of $f(x)=\frac{e^x}{x+1}$ have a horizontal tangent?

(A) $x=0$ (B) $x=1$ (C) $x=-1$ (D) $x=e$ (E) at no x-value

_____8. $\frac{d}{dx}\left[e^{\ln(\ln x)}\right]=$ (A) $\ln x$ (B) x (C) $\frac{1}{x}$ (D) e^x (E) $e^{\ln(\ln x)}$

_____9. If $y=\ln\left[\frac{2x^2}{\sqrt{x+3}}\right]$, what is $\left.\frac{dy}{dx}\right|_{x=1}$?

(A) 0 (B) $\frac{15}{8}$ (C) $\frac{7}{4}$ (D) $\ln\left(\frac{15}{8}\right)$ (E) $\ln\left(\frac{7}{4}\right)$

Part Two: Free Response

10. Consider the curve given by the equation $y^3 - xy = 2$. It can be shown that $\frac{dy}{dx} = \frac{y}{3y^2 - x}$.

(a) Write an equation for the line tangent to the curve at the point $(-1,1)$.

(b) Find the coordinates (x, y) of all the points on the curve at which the line tangent to the curve at that point is vertical.

(c) Evaluate $\frac{d^2y}{dx^2}$ at the point on the curve where $x = -1$ and $y = 1$.