

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

_____ 1. If $x^2 + y^2 = 25$, what is the value of $\frac{d^2y}{dx^2}$ the point $(4,3)$?

- (A) $-\frac{7}{27}$ (B) $\frac{25}{27}$ (C) $\frac{3}{4}$ (D) $-\frac{25}{27}$ (E) $\frac{7}{27}$

_____ 2. If $f(x) = (x-1)(x^2+2)^3$, then $f'(x) =$

- (A) $6x(x^2+2)^2$ (B) $6x(x-1)(x^2+2)^2$ (C) $(x^2+2)^2(x^2+3x-1)$
 (D) $(x^2+2)^2(7x^2-6x+2)$ (E) $-3(x-1)(x^2+2)^2$

_____ 3. If $y = x^2 \sin(2x)$, then $\frac{dy}{dx} =$

- (A) $2x \cos(2x)$ (B) $4x \cos(2x)$ (C) $2x[\sin(2x) + \cos(2x)]$
 (D) $2x[\sin(2x) - x \cos(2x)]$ (E) $2x[\sin(2x) + x \cos(2x)]$

_____ 4. 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) $\frac{5}{3}$

_____ 5. $\frac{d}{dx}[\cos^2(x^3)] =$

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

_____ 6. An equation of the line tangent to the graph of $y = \frac{2x+3}{3x-2}$ at the point $(1,5)$ is

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

_____ 7. $\frac{d}{dx}[\sec x - \cot x] =$

- (A) $\sec^2 x + \cot^2 x$ (B) $\sec x \tan x + \csc^2 x$ (C) $\sec x \tan x - \csc^2 x$ (D) $\sec^2 x + \csc x \cot x$ (E) 5

_____ 8. If $x^3 + 3xy + 2y^3 = 17$, then in terms of x and y , $\frac{dy}{dx} =$

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

Part Los Dos: Free Response.

10. An elephant moves along a vertical line and has a position equation $y(t) = (2t - 1)(t - 4)$ with $y(t)$ measured in furlongs (about 210 meters) and t measured in heleks (about 3.3 seconds) and $t \geq 0$. Answer the following. Be sure to include units in your final answer(s), lest you lose valuable points and class rank slots.

- (a) What is the initial position of the elephant?
- (b) When is the first time the elephant is at the zero position?
- (c) What is the elephant's displacement on the interval from $t = 0$ to $t = 1$ heleks?
Explain what that number means in terms of the elephant's starting position.
- (d) What is the elephant's average velocity on the interval from $t = 0$ to $t = 1$ heleks?
- (e) What is the elephant's velocity at $t = 1$ heleks? Write a sentence explaining the meaning of your answer in terms of the elephant's position.
- (f) What is the elephant's acceleration at $t = 1$ heleks?
- (g) At what time (in heleks) does the elephant change directions? Justify.
- (h) At $t = 1$ heleks, is the speed of the elephant increasing or decreasing? Justify.

