

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

\_\_\_\_\_ 1.  $\lim_{h \rightarrow 0} \frac{\cot 2\left(\frac{5f}{6} + h\right) - \cot \frac{5f}{3}}{h} =$   
 (A)  $-\frac{8}{3}$     (B)  $\frac{8}{3}$     (C)  $-\frac{4}{3}$     (D)  $\frac{4}{3}$     (E)  $-\frac{3}{2}$

\_\_\_\_\_ 2. If  $y = \frac{x-1}{x+1}$ , then  $\frac{dy}{dx} =$   
 (A)  $\frac{2x}{(x+1)^2}$     (B)  $\frac{2}{x+1}$     (C)  $\frac{2}{(x+1)^2}$     (D)  $-\frac{2x}{(x+1)^2}$     (E)  $\frac{2x}{x+1}$

\_\_\_\_\_ 3. If  $f$  is differentiable at  $x = 0$ , and  $g(x) = [f(x)]^2$ ,  $f(0) = f'(0) = -1$ , then  $g'(0) =$   
 (A)  $-2$     (B)  $-1$     (C)  $1$     (D)  $4$     (E)  $2$

\_\_\_\_\_ 4. Suppose  $x^2 - xy + y^2 = 3$ , find  $\frac{dy}{dx}$  at the point  $(a, b)$ .  
 (A)  $\frac{a-2b}{2a-b}$     (B)  $\frac{b-2a}{2b-a}$     (C)  $\frac{a-2b}{2a+b}$     (D)  $\frac{b-2a}{2b+a}$     (E)  $\frac{b+2a}{2b+a}$

\_\_\_\_\_ 5. If  $\sin y = \cos x$ , find  $\frac{dy}{dx}$  at the point  $\left(\frac{f}{2}, f\right)$   
 (A)  $-1$     (B)  $0$     (C)  $1$     (D)  $\frac{f}{2}$     (E) none of these

\_\_\_\_\_ 6. An equation of the line tangent to the graph of  $y = x^2(2x+1)^4$  at  $x = -1$ .  
 (A)  $y = -6x - 5$     (B)  $y = -6x + 2$     (C)  $y = -10x - 9$     (D)  $y = -10x + 11$     (E)  $y = 6x + 7$

\_\_\_\_\_ 7.  $\frac{d}{dx}[\csc x - \cos x] =$   
 (A)  $\csc x \cot x - \sin x$     (B)  $-\csc^2 x - \sin x$     (C)  $\sin x - \csc x \cot x$     (D)  $-\csc^2 x + \sin x$     (E)  $5$

\_\_\_\_\_ 8. If  $y = -\frac{1}{\sqrt{x^2+1}}$ , then  $\frac{dy}{dx} =$   
 (A)  $\frac{x}{\sqrt{x^2+1}}$     (B)  $-\frac{x}{\sqrt{x^2+1}}$     (C)  $-\frac{x}{\sqrt{(x^2+1)^3}}$     (D)  $\frac{x}{\sqrt{(x^2+1)^3}}$     (E)  $\frac{x}{x^2+1}$

Part Los Dos: Frei Response.

9. An elephant moves along a vertical line and has a position equation  $y(t) = (3t - 1)(t - 2)$  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.

