More practices on derivatives
AP Calc AB

1. If $f(x) = e^{1/x}$, then $f'(x) =$

(A) $-\dfrac{e^{1/x}}{x^2}$ (B) $-e^{1/x}$ (C) $\dfrac{e^{1/x}}{x}$ (D) $\dfrac{e^{1/x}}{x^2}$ (E) $\dfrac{1}{x}e^{(1/x)-1}$

4. For what non-negative value of b is the line given by $y = -\frac{1}{3}x + b$ normal to the curve $y = x^3$?

(A) 0 (B) 1 (C) $\dfrac{4}{3}$ (D) $\dfrac{10}{3}$ (E) $\dfrac{10\sqrt{3}}{3}$

6. If $f(x) = \dfrac{x-1}{x+1}$ for all $x \neq -1$, then $f'(1) =$

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

8. If $h(x) = f^2(x) - g^2(x)$, $f'(x) = -g(x)$, and $g'(x) = f(x)$, then $h'(x) =$

(A) 0 (B) 1 (C) $-4f(x)g(x)$

(D) $(-g(x))^2 - (f(x))^2$ (E) $-2(-g(x) + f(x))$

8. If f is a function such that $\lim_{x \to 2} \frac{f(x) - f(2)}{x - 2} = 0$, which of the following must be true?

(A) The limit of $f(x)$ as x approaches 2 does not exist.

(B) f is not defined at $x = 2$.

(C) The derivative of f at $x = 2$ is 0.

(D) f is continuous at $x = 0$.

(E) $f(2) = 0$

11. Let $y = x\sqrt{1+x^2}$. When $x = 0$ and $dx = 2$, the value of dy is

(A) –2 (B) –1 (C) 0 (D) 1 (E) 2

18. If $f(x) = 2 + |x - 3|$ for all x, then the value of the derivative $f'(x)$ at $x = 3$ is

(A) -1 (B) 0 (C) 1 (D) 2 (E) nonexistent

19. If f and g are twice differentiable functions such that $g(x) = e^{f(x)}$ and $g''(x) = h(x)e^{f(x)}$, then $h(x) =$

(A) $f'(x) + f''(x)$

(B) $f'(x) + \left(f''(x)\right)^2$

(C) $\left(f'(x) + f''(x)\right)^2$

(D) $\left(f'(x)\right)^2 + f''(x)$

(E) $2f'(x) + f''(x)$

32. An equation of the line <u>normal</u> to the graph of $y = x^3 + 3x^2 + 7x - 1$ at the point where $x = -1$ is

(A) $4x + y = -10$ (B) $x - 4y = 23$ (C) $4x - y = 2$ (D) $x + 4y = 25$ (E) $x + 4y = -25$

33. Suppose that f is an odd function; i.e., $f(-x) = -f(x)$ for all x. Suppose that $f'(x_0)$ exists. Which of the following must necessarily be equal to $f'(-x_0)$?

(A) $f'(x_0)$

(B) $-f'(x_0)$

(C) $\frac{1}{f'(x_0)}$

(D) $-\frac{1}{f'(x_0)}$

(E) None of the above

39. Let f and g be differentiable functions such that

$f(1) = 2$, $f'(1) = 3$, $f'(2) = -4$,

$g(1) = 2$, $g'(1) = -3$, $g'(2) = 5$.

If $h(x) = f(g(x))$, then $h'(1) =$

(A) –9 (B) –4 (C) 0 (D) 12 (E) 15

45. If $\frac{d}{dx}(f(x)) = g(x)$ and $\frac{d}{dx}(g(x)) = f(x^2)$, then $\frac{d^2}{dx^2}\left(f(x^3)\right) =$

(A) $f\left(x^6\right)$

(B) $g\left(x^3\right)$

(C) $3x^2 g\left(x^3\right)$

(D) $9x^4 f\left(x^6\right) + 6x\,g\left(x^3\right)$

(E) $f\left(x^6\right) + g\left(x^3\right)$