BC - AP Review Derivatives name _____

1.If $f(x) = x^{\frac{3}{2}}$, then $f'(4) =$

(A) –6 (B) –3 (C) 3

(D) 6 (E) 8

2. 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) $\frac{-x^2}{1 + 2y^2}$

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

(A) $13x - y = 8$ (B) $13x + y = 18$ (C) $x - 13y = 64$

(D) $x + 13y = 66$ (E) $-2x + 3y = 13$

4. If $y = \tan x - \cot x$, then $\frac{dy}{dx} =$

(A) $\sec x \csc x$ (B) $\sec x - \csc x$ (C) $\sec x + \csc x$

(D) $\sec^2 x - \csc^2 x$ (E) $\sec^2 x + \csc^2 x$

5. If $f(x) = (x-1)^2 \sin x$, then $f'(0) =$

(A) –2 (B) –1 (C) 0

(D) 1 (E) 2

6. . The slope of the line normal to the graph of $y = 2\ln(\sec x)$ at $x = \frac{\pi}{4}$ is

(A) –2 (B) $-\frac{1}{2}$ (C) $\frac{1}{2}$

(D) 2 (E) nonexistent

7. If $f(x) = \left(x^2 - 2x - 1\right)^{\frac{2}{3}}$, then $f'(0)$ is

(A) $\frac{4}{3}$ (B) 0 (C) $-\frac{2}{3}$

(D) $-\frac{4}{3}$ (E) –2

8. $\frac{d}{dx}\left(2^x\right) =$

(A) 2^{x-1} (B) $\left(2^{x-1}\right)x$ (C) $\left(2^x\right)\ln 2$

(D) $\left(2^{x-1}\right)\ln 2$ (E) $\frac{2x}{\ln 2}$

9.. If $f(x) = e^{3\ln(x^2)}$, then $f'(x) =$

(A) $e^{3\ln(x^2)}$ (B) $\frac{3}{x^2}e^{3\ln(x^2)}$ (C) $6\left(\ln x\right)e^{3\ln(x^2)}$

(D) $5x^4$ (E) $6x^5$

10. If f is a differentiable function, then $f'(a)$ is given by which of the following?

I. $\lim_{h\to 0}\dfrac{f(a+h)-f(a)}{h}$

II. $\lim_{x\to a}\dfrac{f(x)-f(a)}{x-a}$

III. $\lim_{x\to a}\dfrac{f(x+h)-f(x)}{h}$

(A) I only (B) II only (C) I and II only

(D) I and III only (E) I, II, and III

11. If $f(x)=x\sqrt{2x-3}$, then $f'(x)=$

(A) $\dfrac{3x-3}{\sqrt{2x-3}}$ (B) $\dfrac{x}{\sqrt{2x-3}}$ (C) $\dfrac{1}{\sqrt{2x-3}}$

(D) $\dfrac{-x+3}{\sqrt{2x-3}}$ (E) $\dfrac{5x-6}{2\sqrt{2x-3}}$

12. If $f(x)=-x^3+x+\dfrac{1}{x}$, then $f'(-1)=$

(A) 3 (B) 1 (C) –1

(D) –3 (E) –5

13. $\dfrac{d}{dx}\cos^2(x^3)=$

(A) $6x^2\sin(x^3)\cos(x^3)$ (B) $6x^2\cos(x^3)$

(C) $\sin^2\left(x^3\right)$ (D) $-6x^2\sin(x^3)\cos(x^3)$

(E) $-2\sin(x^3)\cos(x^3)$

14. An equation of the line tangent to the graph of $y = \cos(2x)$ at $x = \frac{\pi}{4}$ is

(A) $y - 1 = -\left(x - \frac{\pi}{4}\right)$ (B) $y - 1 = -2\left(x - \frac{\pi}{4}\right)$

(C) $y = 2\left(x - \frac{\pi}{4}\right)$ (D) $y = -\left(x - \frac{\pi}{4}\right)$

(E) $y = -2\left(x - \frac{\pi}{4}\right)$

15. At what point on the graph of $y = \frac{1}{2}x^2$ is the tangent line parallel to the line $2x - 4y = 3$?

(A) $\left(\frac{1}{2}, -\frac{1}{2}\right)$ (B) $\left(\frac{1}{2}, \frac{1}{8}\right)$ (C) $\left(1, -\frac{1}{4}\right)$

(D) $\left(1, \frac{1}{2}\right)$ (E) $(2, 2)$

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

(A) $-\frac{25}{27}$ (B) $-\frac{7}{27}$ (C) $\frac{7}{27}$

(D) $\frac{3}{4}$ (E) $\frac{25}{27}$

17. If $f(x) = \ln|x^2 - 1|$, then $f'(x) =$

(A) $\left|\frac{2x}{x^2 - 1}\right|$ (B) $\frac{2x}{|x^2 - 1|}$ (C) $\frac{2|x|}{x^2 - 1}$

(D) $\frac{2x}{x^2 - 1}$ (E) $\frac{1}{x^2 - 1}$

*18. If $f(x)=\dfrac{e^{2x}}{2x}$, then $f'(x)=$

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

(D) $\dfrac{e^{2x}(2x+1)}{x^2}$ (E) $\dfrac{e^{2x}(2x-1)}{2x^2}$

*19. Let *f* be a function such that $\lim\limits_{h\to 0}\dfrac{f(2+h)-f(2)}{h}=5$. Which of the following must be true?

I. *f* is continuous at *x* = 2.
II. *f* is differentiable at *x* = 2.
III. The derivative of *f* is continuous at *x* = 2.

(A) I only (B) II only (C) I and II only

(D) I and III only (E) II and III only

*20. Let *f* be the function given by $f(x)=2e^{4x^2}$. For what value of *x* is the slope of the line tangent to the graph of *f* at $(x, f(x))$ equal to 3?

(A) 0.168 (B) 0.276 (C) 0.318

(D) 0.342 (E) 0.551

*21. Let $f(x)=\sqrt{x}$. If the rate of change of *f* at *x* = *c* is twice its rate of change at *x* = 1, then *c* =

(A) $\dfrac{1}{4}$ (B) 1 (C) 4

(D) $\dfrac{1}{\sqrt{2}}$ (E) $\dfrac{1}{2\sqrt{2}}$

22. If $x^2+xy=10$, then when $x=2$, $\dfrac{dy}{dx}=$

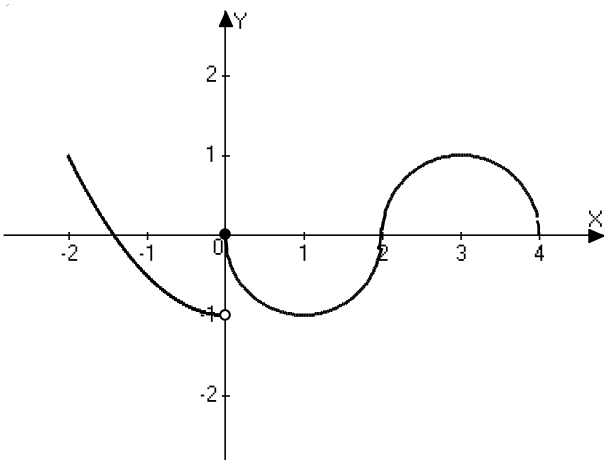
(A) $-\dfrac{7}{2}$ (B) -2 (C) $\dfrac{2}{7}$

(D) $\dfrac{3}{2}$ (E) $\dfrac{7}{2}$

23. What is the instantaneous rate of change at $x = 2$ of the function f given by $f(x) = \dfrac{x^2 - 2}{x - 1}$?

(A) -2 (B) $\dfrac{1}{6}$ (C) $\dfrac{1}{2}$

(D) 2 (E) 6



24. The graph of the function f shown in the figure above has a vertical tangent at the point (2, 0) and horizontal tangents at the points (1, –1) and (3, 1). For what values of x, $-2 < x < 4$, is f not differentiable?

(A) 0 only (B) 0 and 2 only (C) 1 and 3 only

(D) 0, 1, and 3 only (E) 0, 1, 2, and 3

25. If $f(x) = \sin\left(e^{-x}\right)$, then $f'(x) =$

(A) $-\cos\left(e^{-x}\right)$ (B) $\cos\left(e^{-x}\right) + e^{-x}$ (C) $\cos\left(e^{-x}\right) - e^{-x}$

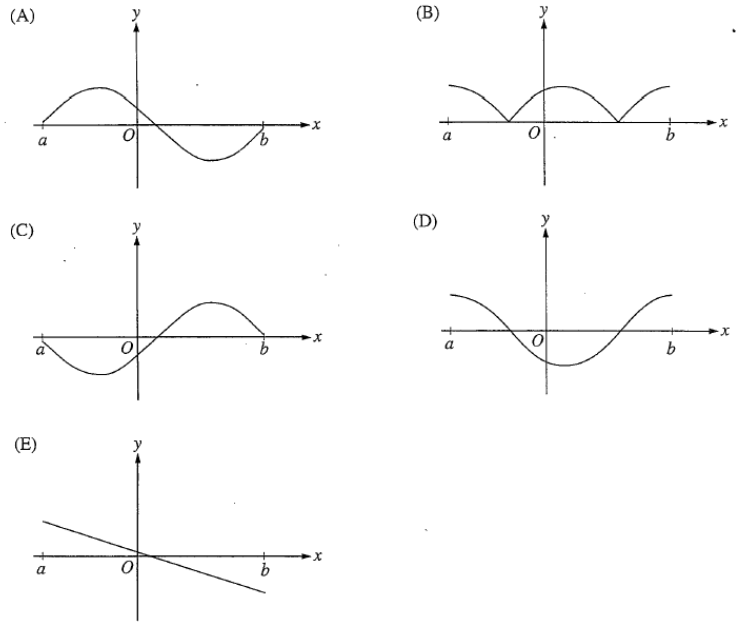
(D) $e^{-x}\cos\left(e^{-x}\right)$ (E) $-e^{-x}\cos\left(e^{-x}\right)$

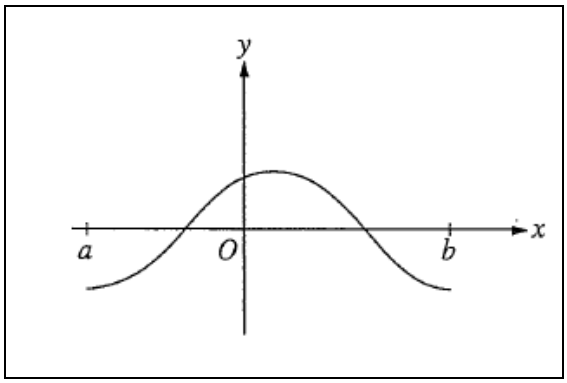
26. An equation of the line tangent to the graph of $y = x + \cos x$ at the point (0, 1) is

(A) $y = 2x + 1$ (B) $y = x + 1$ (C) $y = x$

(D) $y = x - 1$ (E) $y = 0$

27. The graph of f is shown in the figure below. Which of the following could be the graph of the derivative of f?





34. If $f(x) = \tan(2x)$, then $f'\left(\frac{\pi}{6}\right) =$

(A) $\sqrt{3}$ (B) $2\sqrt{3}$ (C) 4

(D) $4\sqrt{3}$ (E) 8

*35. Let f be the function given by $f(x) = 3e^{2x}$ and let g be the function given by $g(x) = 6x^3$. At what value of x do the graphs of f and g have parallel tangent lines?

(A) – 0.701 (B) – 0.567 (C) – 0.391

(D) – 0.302 (E) – 0.258

*36. Which of the following is an equation of the line tangent to the graph of $f(x) = x^4 + 2x^2$ at the point where $f'(x) = 1$?

(A) $y = 8x - 5$ (B) $y = x + 7$ (C) $y = x + 0.763$

(D) $y = x - 0.122$ (E) $y = x - 2.146$