AP calculus - to-date MC Questions

Name _____

Show all work. Use calculator only when specified.

① If $f(x) = x\sqrt{3x-4}$, then $f'(x) =$

(A) $\frac{3x-1}{\sqrt{3x-4}}$

(B) $\frac{6x-7}{\sqrt{3x-4}}$

(C) $\frac{9x-8}{2\sqrt{3x-4}}$

(D) $\frac{6x-5}{\sqrt{3x-4}}$

(E) $\frac{6x-5}{2\sqrt{3x-4}}$

② If $f(x) = \frac{x-2}{x+2}$ for all $x \neq -2$, then $f'(2) =$

(A) -2

(B) $\frac{1}{4}$

(C) 0

(D) $-\frac{1}{4}$

(E) 2

③ If $f(x) = \frac{e^{(3x)}}{3x}$, then $f'(x) =$

(A) $\frac{e^{(3x)}(3x-1)}{3x^2}$

(B) $\frac{e^{(3x)}(1-3x)}{3x^2}$

(C) $e^{(3x)}$

(D) $\frac{e^{(3x)}(3x+1)}{x^2}$

(E) 1

④ If $f(x) = \cos(e^{(-x)})$, then $f'(x) =$

(A) $-\sin(e^{(-x)})$

(B) $\sin(e^{(-x)})$

(C) $\sin(e^{(-x)}) - e^{(-x)}$

(D) $e^{(-x)}\sin(e^{(-x)})$

(E) $-e^{(-x)}\sin(e^{(-x)})$

⑤ If $f(x) = x^{\frac{5}{2}}$, then $f'(4) =$

(A) -10

(B) 24

(C) 5

(D) 10

(E) 20

(6) If $f(x) = \sqrt[3]{3x}$, then $f'(9)$

(A) $\frac{1}{9}$

(B) $\frac{1}{3}$

(C) $\frac{\sqrt[3]{3}}{3}$

(D) 1

(E) $\sqrt[3]{3}$

(7) If $y = x^3e^x$, then $\frac{dy}{dx} =$

(A) $3xe^x$

(B) $3x^2e^x$

(C) $3x^2e^x + x^3e^x$

(D) $3x^2 + e^x$

(E) $3x + e$

(8) $\frac{d}{dx}(\frac{1}{x^2} - \frac{1}{x} + x^3)$ at $x = -1$ is

(A) -6

(B) -4

(C) 0

(D) 4

(E) 6

(9) $\frac{d}{dx}\sin^2(x^3) =$

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

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

(C) $cos^2(x^3)$

(D) $-6x^2 sin(x^3)cos(x^3)$

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

(10) If $f(x) = \tan(3x)$, then $f'(\frac{\pi}{9}) =$

(A) 12

(B) 3

(C) $\frac{1}{4}$

(D) 6

(E) 4

(11) If $e^{f(x)} = 1 + x^3, x > -1$, then $f'(x) =$

(A) $\frac{1}{1+x^3}$

(B) $\frac{3x^2}{1+x^3}$

(C) $3x^2(e^{1+x^3})$

(D) $3x^2(1+x^3)$

(E) $3x^2 ln(1+x^3)$

(12) If $y = 8^{(x^2-1)}$, then $\frac{dy}{dx} =$

(A) $(\ln 8)8^{(x^2-1)}$

(B) $2x(\ln 8)8^{(x^2-1)}$

(C) $(x^2-1)8^{(x^2-2)}$

(D) $(2x)8^{(x^2-1)}$

(E) $x^2(\ln 8)8^{(x^2-1)}$

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(13) If $\cos x = e^y$, $0 < x < \pi$, what is $\frac{dy}{dx}$ in terms of x?

(A) $\tan x$

(B) $-\tan x$

(C) $\sec x$

(D) $\cot x$

(E) $-\cot x$

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(14) If $y = \frac{\ln(2x)}{x}$, then $\frac{dy}{dx} =$

(A) $\frac{2}{x}$

(B) $\frac{1}{x^2}$

(C) $\frac{1-\ln(2x)}{x^2}$

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

(E) $\frac{2+\ln(2x)}{x^2}$

(15) If $f(x) = x\ln(x^3)$, then $f'(x) =$

(A) $\ln(x^3)+1$

(B) $\ln(x^3)+3$

(C) $\ln(x^3)+\frac{3}{x}$

(D) $\ln(x^3)+\frac{3}{x^2}$

(E) $\ln(x^3)+\frac{3}{x^3}$

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(16) If $y = 3\cos(\frac{x}{3})$, then $\frac{d^2y}{dx^2} =$

(A) $-3\cos(\frac{x}{3})$

(B) $-3\sin(\frac{x}{3})$

(C) $-\frac{1}{3}\cos(\frac{x}{3})$

(D) $-\frac{1}{3}\sin(\frac{x}{3})$

(E) $-\cos(\frac{x}{3})$

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(17) If $f(x) = e^{x^2}$, then $f'(x) =$

(A) $-\frac{2e^{x^2}}{x^2}$

(B) $\frac{2e^{x^2}}{x^2}$

(C) $-\frac{e^{x^2}}{2x^2}$

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

(E) $\frac{e^{x^2}}{2x}$

(18) If $f(x) = \ln(\ln x^2)$, then $f'(x) =$

(A) $\frac{1}{x^2}$

(B) $\frac{2}{x}$

(C) $\frac{1}{\ln x^2}$

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

(E) $\frac{2}{x \ln x^2}$

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(19) If $f(x) = x\cot x$, then $f'\left(\frac{\pi}{4}\right) =$

(A) 2

(B) $\frac{1}{2}$

(C) $1-\frac{\pi}{2}$

(D) $\frac{\pi}{2}-1$

(E) $1+\frac{\pi}{2}$

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(20) $\frac{d}{dx}\ln\left(\frac{2}{2-x}\right) =$

(A) $\frac{2}{2-x}$

(B) $\frac{2}{x-2}$

(C) $\frac{2-x}{2}$

(D) $\frac{x-2}{2}$

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

(21) If $f(x) = e^{\cot^2 x}$, then $f'(x) =$

(A) $e^{\cot^2 x}$

(B) $-\csc^2 x e^{\cot^2 x}$

(C) $-\cot^2 x e^{\cot^2 x - 1}$

(D) $-2\cot x \csc^2 x e^{\cot^2 x}$

(E) $-2\cot x e^{\cot^2 x}$

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(22) 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) $10x + y = 2$

(B) $10x + y = 81$

(C) $-10x + y = -81$

(D) $x - 10y = 81$

(E) $-10x + y = 2$

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(23) $\lim_{h\to 0} \frac{e^{(3+h)} - e^3}{h} =$

(A) 0

(B) $-e^3$

(C) $-3e^2$

(D) e^3

(E) $3e^3$

(24) If $a \neq 0$, then $\lim_{x \to a} \frac{x-a}{x^3-a^3}$ is

(A) 0

(B) $\frac{1}{a^2}$

(C) $\frac{1}{3a^2}$

(D) a^2

(E) *nonexistent*

(25) If $f(x) = 3x^2 + 1$, then $\lim_{x \to 0} \frac{f(x) - f(0)}{x^2}$ is

(A) 0

(B) 1

(C) 2

(D) 3

(E) *nonexistent*

(26) If $f(x) = \begin{cases} 2 - x^2, x < 2 \\ x + 4, x = 2 \\ x^2 + 2, x > 2 \end{cases}$, then which of the following are true?

I. $\lim_{x \to 2^-} f(x) = -2$

II. $\lim_{x \to 2^+} f(x) = 6$

III. $\lim_{x \to 2} f(x) = 6$

(A) I only (B) II only (C) III only (D) I and II only (E) I and III only

(27) If $y^2 + 2xy = 12$, then $\frac{dy}{dx} =$

(A) $-\frac{y}{x+y}$

(B) $\frac{y}{x-y}$

(C) $\frac{y}{x+y}$

(D) $\frac{x}{x+y}$

(E) $\frac{x}{x-y}$

(28) An equation of the line tangent to the graph of $y = \frac{3x+4}{4x-3}$ at the point (1,7) is

(A) $27x - y = 32$

(B) $27x + y = 32$

(C) $25x + y = 32$

(D) $25x + y = 30$

(E) $25x - y = 30$

(29) $f(x) = \begin{cases} x + 5 & \text{, if } x \leq 3 \\ 3x - 1 & \text{, if } x > 3 \end{cases}$

Let f be the function given above. Which of the following is true about f?

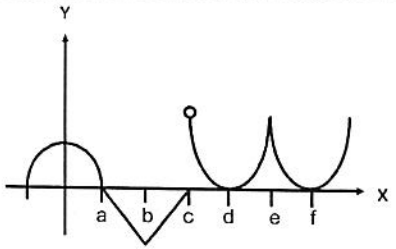
I. $\lim_{x \to 3} f(x)$ exists.

II. f is continuous at x=3.

III. f is differentiable at x=3.

(A) None
(B) I Only
(C) II Only
(D) I and II Only
(E) I, II, and III

(30)



The graph of the function f is shown above. At which value(s) of x is f continuous but not differentiable?

(A) b Only
(B) c Only
(C) e Only
(D) b, and e Only
(E) a, b, and e Only

(31) calc

$\frac{d}{dx}\left(\frac{1}{\ln e^{(5x)}}\right)$ at $x = e$ is

(A) 0.027

(B) 0.200

(C) −0.027

(D) 0.074

(E) −0.074

(32) calc

If $f(x) = \frac{-1}{|x|}$, then $f'(2) =$

(A) 0.050

(B) −0.250

(C) 0.250

(D) −0.050

(E) −0.500

(33) calc

$\frac{d}{dx}(3^{2x})$ at $x = 1$ is

(A) 9.888

(B) 19.775

(C) 16.384

(D) 6

(E) 9

(34) calc

$\frac{d}{dx}(e^{|x|} + 1)$ at $x = -1$ is

(A) 3.718

(B) −3.718

(C) 2.718

(D) −2.718

(E) *nonexistent*

(35)

If $f(x) = 3 + |x - 4|$ for all x, then the value of the derivative $f'(x)$ at $x = 4$ is

(A) −1

(B) 0

(C) 1

(D) 3

(E) *nonexistent*

(36) If $f(x) = (x^3 + x^2 + 2x + 1)^{\frac{2}{3}}$, then $f'(-1)$ is

(A) $\frac{2}{3}$

(B) $-\frac{2}{3}$

(C) 0

(D) 2

(E) -2

(37) The line <u>normal</u> to the curve $y = \sqrt{9 - x}$ at the point $(0,3)$ has slope

(A) 6

(B) 3

(C) $\frac{1}{6}$

(D) $\frac{-1}{6}$

(E) -6

(38) The slope of the line tangent to the curve $y^2+(xy+1)^2=10$ at $(2,1)$ is

(A) $-\frac{3}{2}$

(B) $\frac{3}{2}$

(C) 0

(D) $\frac{3}{7}$

(E) $-\frac{3}{7}$

(39) $\lim_{x \to \infty} \frac{3x^5 + 4x^3 + 1}{4x^5 - 2x^2 - 1} =$

(A) $\frac{3}{4}$

(B) 2

(C) 0

(D) -1

(E) *nonexistent*

(40) $\lim_{x \to 0} \frac{7x^5 - 2x^3}{3x^5 + 10x^3} =$

(A) $\frac{7}{3}$

(B) 1

(C) $-\frac{1}{5}$

(D) 0

(E) *nonexistent*

(41) $\lim_{x \to 0} \frac{\sin^3(3x)}{x^3} =$

(A) 0

(B) 1

(C) 3

(D) 9

(E) 27

(42)

$\lim_{x \to 0} x \sec x \cot x$

(A) 0

(B) 1

(C) ∞

(D) -1

(E) $-\infty$

(43)

If $x^2 - xy = 6$, then when $x = -e$, $\frac{dy}{dx} =$

(A) $e + \frac{6}{e}$

(B) $e + \frac{6}{e^2}$

(C) $1 - 6e^2$

(D) $1 + \frac{6}{e^2}$

(E) $1 + 6e^2$

(44)

calc

If $x^2 + y^2 = 36$, then what is the value of $\frac{d^2y}{dx^2}$ at the point $\left(1, \sqrt{35}\right)$?

(A) -0.169

(B) 0.174

(C) 0.169

(D) -0.174

(E) 0

(45)

If $f(x) = \frac{x^2 + 5x}{x^3 - 25x}$, then which of the following is false?

I. $\lim_{x \to 0} f(x) = 0$

II. $\lim_{x \to -5} f(x) = -\frac{1}{10}$

III. $\lim_{x \to 5} f(x)$ is *nonexistent*

(A) I only (B) II only (C) III only (D) I and II only (E) I and III only