

Form C. Instructions: (44 points). Solve each of the following problems and choose the correct answer :

(1) The range of the function $f(x) = \frac{x+2}{|x+2|}$ is

- (a) $[0, \infty)$
- (b) $\{-1, 1\}$ *
- (c) \mathbb{R}
- (d) $\mathbb{R} - \{-2\}$.

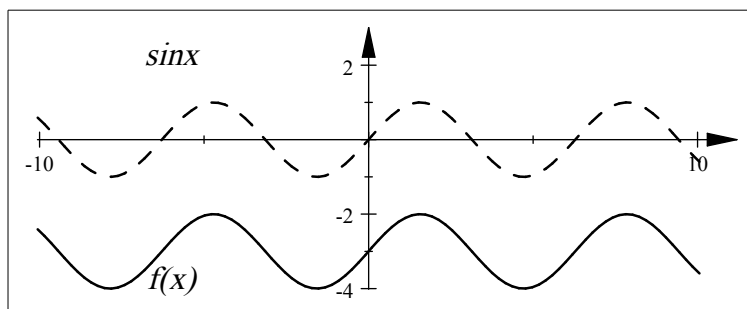
(2) The function $f(x)$ is an even if $f(-x) = -f(x)$ for every $x \in D_f$

- (a) True
- (b) False. *

(3) $\cos\left(\frac{5\pi}{2} + 2\pi\right) = \cos\frac{5\pi}{2}$

- (a) True *
- (b) False.

(4) The following figure shows the graph of $y = \sin x$ shifted to a new position.



An equation for the new function is

- (a) $f(x) = \sin(x - 3)$
- (b) $f(x) = \sin x + 3$
- (c) $f(x) = \sin(x + 3)$
- (d) $f(x) = \sin x - 3$. *

(5) The domain of the function $f(x) = \frac{1}{1 + e^x}$ is

- (a) $(0, \infty)$
- (b) $\mathbb{R} - \{-1\}$
- (c) \mathbb{R} *
- (d) $\mathbb{R} - \{0\}$.

(6) If $f(x) = 2 + e^x$, then $f^{-1}(x) =$

- (a) $\ln(x - 2)$ *
- (b) $\ln x - 2$
- (c) $\ln(x + 2)$
- (d) $\ln x + 2$.

(7) $\sec^{-1}\left(\frac{2}{\sqrt{3}}\right) = \frac{\pi}{6}$

(a) True *

(b) False.

(8) If $e^{2x+3} = 1$, then $x =$

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

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

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

(d) $-\frac{3}{2}$ *

(9) $\lim_{x \rightarrow 0^-} \frac{3x + |x|}{x} =$

(a) 1

(b) 4

(c) 2 *

(d) Does not exist.

(10) $\lim_{x \rightarrow -4} \frac{e^c}{9} =$

(a) $\frac{e^c}{9}$ *

(b) $\frac{e^{-4}}{9}$

(c) $-\frac{4}{9}$

(d) 0

(11) If $\lim_{x \rightarrow a} f(x) = \frac{2}{5}$ and $\lim_{x \rightarrow a} g(x) = \frac{4}{7}$, then $\lim_{x \rightarrow a} \frac{f(x)}{g(x)} =$

(a) $\frac{10}{7}$

(b) $\frac{7}{10}$ *

(c) $\frac{35}{8}$

(d) $\frac{8}{35}$

(12) $\lim_{x \rightarrow 1^+} \frac{x+2}{x-1} = -\infty$

(a) True

(b) False. *

(13) $\lim_{x \rightarrow 0} \frac{\sin 3x}{\sin 7x} =$

- (a) $\frac{3}{7}$ *
- (b) $\frac{7}{3}$
- (c) 1
- (d) Does not exist.

(14) The horizontal asymptote(s) of the function $f(x) = \frac{\sqrt{4x^2 - 3x}}{x - 2}$ is (are)

- (a) $x = 2$
- (b) $y = -1$
- (c) $y = 1$
- (d) $y = 2, y = -2$. *

(15) $\lim_{x \rightarrow \infty} (1 - e^x) =$

- (a) 0
- (b) ∞
- (c) $-\infty$ *
- (d) -1

(16) The vertical asymptote(s) of the curve $y = \frac{x - 3}{x^2 - 9}$ is (are)

- (a) $y = -3$
- (b) $x = 3, x = -3$
- (c) $x = 3$
- (d) $x = -3$ *

(17) The function $f(x) = \begin{cases} \frac{x^2 + 2x}{x + 2} & \text{if } x \neq -2 \\ 1 & \text{if } x = -2 \end{cases}$ is continuous on

- (a) $\mathbb{R} - \{-2\}$ *
- (b) $\mathbb{R} - \{2\}$
- (c) $\mathbb{R} - \{1\}$
- (d) \mathbb{R} .

(18) The function $f(x) = \frac{3x^2 + 5}{x^2 + 4x + 4}$ is continuous on

- (a) \mathbb{R}
- (b) $\mathbb{R} - \{-2\}$ *
- (c) $\mathbb{R} - \{2\}$
- (d) $\mathbb{R} - \{2, -2\}$

(19) If $f(x) = \tan x$, then $f'(x) =$

- (a) $\lim_{h \rightarrow 0} \frac{\tan x - \tan(x+h)}{h}$
- (b) $\lim_{h \rightarrow 0} \frac{\tan(x-h) + \tan x}{h}$
- (c) $\lim_{h \rightarrow 0} \frac{\tan(x+h) - \tan x}{h}$ *
- (d) $\lim_{h \rightarrow 0} \frac{\tan(x+h) + \tan x}{h}$

(20) If $f(x) = \sqrt{x+4}$, then $f(x)$ is differentiable at $x = -4$

- (a) True
- (b) False. *

(21) The equation for the tangent line to the curve $y = f(x)$, $f(-2) = 2$, $f'(-2) = -4$

- (a) $y = -4x - 6$ *
- (b) $y = -4x - 10$
- (c) $y = 4x + 6$
- (d) $y = 4x + 10$.

(22) $\frac{d}{dx} \cos(\pi/6) =$

- (a) 0 *
- (b) $\sqrt{3}/2$
- (c) $\sin(\pi/6)$
- (d) $-\sin(\pi/6)$

(23) The slope of the tangent line to the curve $f(x) = \sqrt{x}(1+x^2)$ at the point $(1,0)$ is

- (a) 2
- (b) 3 *
- (c) -3
- (d) 5

(24) If $y = 5x^5 + 3x^3 - 7x^2 + 2$, then $y^{(6)} =$

- (a) 0 *
- (b) 30
- (c) 1
- (d) 5

(25) If $f(x) = 3ax^2 + 3x$ and $f''(x) = -12$, then $a =$

- (a) $-\frac{1}{2}$
- (b) $\frac{1}{2}$
- (c) -2 *
- (d) 2

(26) If $f(2) = 4$, $f'(2) = 3$, $g(2) = 2$, $g'(2) = 1$, then $\frac{d}{dx} \left(\frac{g}{f} \right) (2) =$

- (a) $\frac{1}{8}$
- (b) $-\frac{1}{2}$
- (c) $\frac{1}{2}$
- (d) $-\frac{1}{8}$ *

(27) $\frac{d}{dx} \left(\frac{4^x}{\sin x} \right) =$

- (a) $\frac{4^x (\sin x - \cos x)}{\sin^2 x}$
- (b) $\frac{4^x (\ln 4 \sin x - \cos x)}{\sin^2 x}$ *
- (c) $\frac{4^x (\cos x - \ln 4 \sin x)}{\sin^2 x}$
- (d) $\frac{4^x (\cos x - \sin x)}{\sin^2 x}$

(28) The 15th derivative of $\sin x$ is

- (a) $\sin x$
- (b) $-\sin x$
- (c) $\cos x$
- (d) $-\cos x$ *

(29) The equation of the tangent line to the curve $f(x) = -\sin x + \cos x$ at the point $(0, 1)$ is

- (a) $y = x - 1$
- (b) $y = -x - 1$
- (c) $y = 1 - x$ *
- (d) $y = x + 1$

(30) If $y = -e^{\tan x}$, then $y' =$

- (a) $-\tan x e^{\sec^2 x}$
- (b) $\tan x e^{\sec^2 x}$
- (c) $\sec^2 x e^{\tan x}$
- (d) $-\sec^2 x e^{\tan x}$ *

(31) If $y = (x + \cot x)^5$, then $y' =$

- (a) $5(x + \cot x)^4(1 + \csc^2 x)$
- (b) $5(x + \cot x)^4(1 - \csc^2 x)$ *
- (c) $-5(x + \cot x)^4(1 - \csc^2 x)$
- (d) $-5(x + \cot x)^4(1 + \csc^2 x)$

(32) If $x^2 y^3 = 5$, then $y' =$

- (a) $-\frac{3x}{2y}$

(b) $\frac{3x}{2y}$

(c) $-\frac{2y}{3x}$ *

(d) $\frac{2y}{3x}$

(33) $\frac{d}{dx} (\cos^{-1} x^2) = \frac{-2}{\sqrt{1-x^4}}$

(a) True

(b) False *

(34) If $y = (x^3 + 2x^2)^{3/2}$, then $y' =$

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

(b) $\frac{3}{2}(x^3 + 2x^2)^{1/2}(3x^2 + 4x)$ *

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

(d) $\frac{3(3x^2 + 4x)}{2(x^3 + 2x^2)^{1/2}}$

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

(a) $3x^2 \tan x^3$

(b) $-3x^2 \cot x^3$

(c) $-3x^2 \tan x^3$ *

(d) $3x^2 \cot x^3$

(36) If $y = x^{\cos x}$, then $y' =$

(a) $\frac{\cos x}{x} - \sin x \ln x$

(b) $x^{\cos x} \left(\frac{\cos x}{x} - \sin x \ln x \right)$ *

(c) $\cos x (x^{\cos x - 1})$

(d) $-x^{\cos x} \sin x \ln x$

(37) The critical numbers of the function $f(x) = x^3 - 3x^2 - 24x$ are

(a) 2, 4

(b) -2, -4

(c) -2, 4 *

(d) 2, -4

(38) The absolute extreme of the function $f(x) = x^2 - 2x - 5$ on $[0, 3]$ are

	Absolute minimum	Absolute maximum
(a)	$f(3)$	$f(0)$
(b)	$f(0)$	$f(1)$
(c)	$f(0)$	$f(3)$
(d)	$f(1)$	$f(3)$ *

(39) The value(s) of c that satisfies Rolle's theorem for the function $f(x) = 2x^3 - 18x$ on $[0, 3]$ is(are)

deleted

- (a) $\sqrt{3}$ *
- (b) $-\sqrt{3}$
- (c) $\pm\sqrt{3}$
- (d) 3

(40) The function $f(x) = x^3 - 3x$ is decreasing on

- (a) $(-\infty, -1)$
- (b) $(-1, \infty)$
- (c) $(-\infty, -1) \cup (1, \infty)$
- (d) $(-1, 1)$ *

(41) If $f''(x) > 0$ for $1 < x < 3$, then the graph of $f(x)$ is concave down on $(1, 3)$

- (a) True
- (b) False *

(42) The inflection point of the function $f(x) = x^3 - 12x + 12$ is

- (a) $(2, -4)$
- (b) $(-2, 28)$
- (c) $(0, 12)$ *
- (d) f does not have an inflection point.

(43) $\lim_{x \rightarrow -\infty} \frac{e^{-x} + 2}{x^2 + 1} =$ deleted

- (a) $-\infty$
- (b) ∞ *
- (c) 0
- (d) 2

(44) $\lim_{x \rightarrow 0} \frac{1 - \cos x}{5x^2} =$

- (a) $\frac{1}{10}$ *
- (b) $-\frac{1}{10}$
- (c) 0
- (d) 1