**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**) $\mathbb{R} - \{-2\}$.

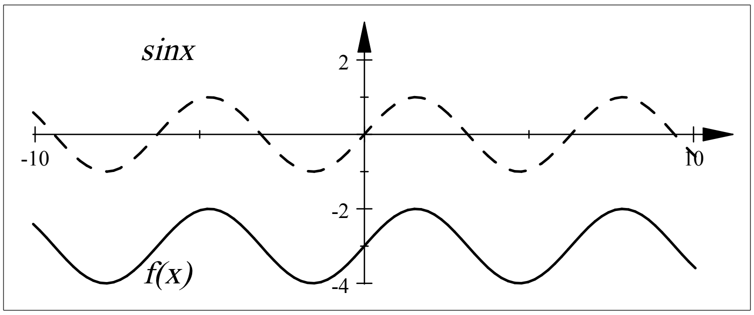
(**2**) The function $f(x)$ is an even if $f(-x) = -f(x)$ for every $x \in D_f$

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

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

(**a**) 1

(**b**) 4

(**c**) 2 *

(**d**) Does not exist.

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

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

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

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

(**d**) 0

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

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

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

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

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

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

(**a**) True

(**b**) False. *

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

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

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

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

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

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

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

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

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

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

(**18**) The function $f(x) = \dfrac{3x^2 + 5}{x^2 + 4x + 4}$ 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**) $\lim_{h \to 0} \frac{\tan x - \tan(x+h)}{h}$

(**b**) $\lim_{h \to 0} \frac{\tan(x-h) + \tan x}{h}$

(**c**) $\lim_{h \to 0} \frac{\tan(x+h) - \tan x}{h}$ *

(**d**) $\lim_{h \to 0} \frac{\tan(x+h) + \tan x}{h}$

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

(**28**) The $15^{th}$ 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 $x^2y^3 = 5$, then $y' =$
(**a**) $-\frac{3x}{2y}$

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

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

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

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

(**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)

(**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**) $\lim\limits_{x\to-\infty} \dfrac{e^{-x}+2}{x^2+1} =$
(**a**) $-\infty$
(**b**) $\infty$ *
(**c**) $0$
(**d**) $2$

(**44**) $\lim\limits_{x\to 0} \dfrac{1-\cos x}{5x^2} =$
(**a**) $\frac{1}{10}$ *
(**b**) $-\frac{1}{10}$
(**c**) $0$
(**d**) $1$