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

1. The range of the function $f(x) = \dfrac{x+4}{|\,x+4\,|}$ is

   (a) $\{-1, 1\}$
   (b) $\mathbb{R}$
   (c) $\mathbb{R} - \{-4\}$
   (d) $[0\ , \infty\ )$

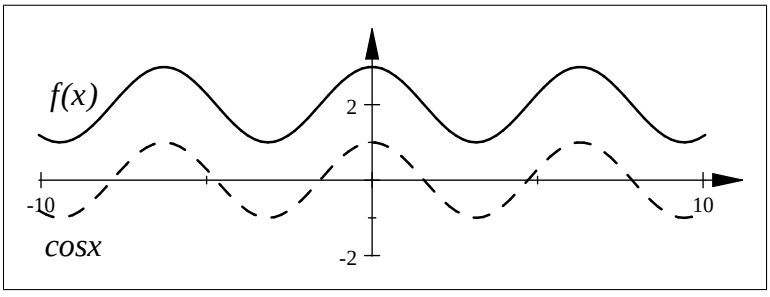
2. The function $f\,(x)$ is an odd function if $f\,(-x) = -f\,(x)$ for every $x \in D_f$

   (a) True
   (b) False

3. $\sin\,(\dfrac{9\pi}{2} + \pi) = \sin\,\dfrac{9\pi}{2}$

   (a) True
   (b) False

4. The accompanying figure shows the graph of $y = \cos x$ shifted to a new position



   An equation for the new function is

   (a) $f(x) = \cos x - 2$
   (b) $f(x) = \cos\,(x-2)$
   (c) $f(x) = \cos\,(x+2)$
   (d) $f(x) = \cos x + 2$

5. The domain of the function $f(x) = \dfrac{1}{3^x - 1}$ is

(a) $\mathbb{R}$

(b) $\mathbb{R} - \{0\}$

(c) $\mathbb{R} - \{1\}$

(d) $(0, \infty)$

6. If $f(x) = 10 + e^x$, then $f^{-1}(x) =$

(a) $\ln(x - 10)$

(b) $\ln x - 10$

(c) $\ln(x + 10)$

(d) $\ln x + 10$

7. $\tan^{-1}(1) = \dfrac{\pi}{4}$

(a) True

(b) False

8. If $e^{5x-4} = 1$, then $x =$

(a) $\dfrac{5}{4}$

(b) $-\dfrac{5}{4}$

(c) $\dfrac{4}{5}$

(d) $-\dfrac{4}{5}$

9. $\lim\limits_{x \to 0^-} \dfrac{3x - |x|}{x} =$

(a) 1

(b) 2

(c) 4

(d) Does not exis.

10. $\lim_{x \to -2} \frac{e^{\,b}}{3} =$

(a) 0

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

(c) $\frac{e^{\,b}}{3}$

(d) $\frac{e^{\,-2}}{3}$

11. If $\lim_{x \to a} f(x) = \frac{3}{4}$ and $\lim_{x \to a} g(x) = \frac{6}{5}$, then $\lim_{x \to a} \frac{f\,(x)}{g\,(x)}$

(a) $\frac{9}{10}$

(b) $\frac{10}{9}$

(c) $\frac{5}{8}$

(d) $\frac{8}{5}$

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

(a) True

(b) False

13. $\lim_{x \to 0} \frac{\tan 5x}{\tan 9x} =$

(a) $\frac{9}{5}$

(b) $\frac{5}{9}$

(c) 1

(d) Does not exist.

14. The horizontal assymptote(s) of the function $f(x) = \frac{\sqrt{9x^2 + 2x}}{x - 4}$ is (are)

(a) $y = -1$

(b) $y = 1$

(c) $y = 3$, $y = -3$

(d) $x = -3$

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

(a) 0

(b) ∞

(c) $-\infty$

(d) 1

16. The vertical asymptotes of the curve $y = \dfrac{x+5}{x^2-25}$ is (are)

(a) $x = 5$

(b) $x = -5$

(c) $x = 5 \;\;,\;\; x = -5$

(d) $y = 5$

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

(a) $\mathbb{R}$

(b) $\mathbb{R} - \{-2\}$

(c) $\mathbb{R} - \{2\}$

(d) $\mathbb{R} - \{1\}$

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

(a) $\mathbb{R} - \{-2\}$

(b) $\mathbb{R} - \{2\}$

(c) $\mathbb{R} - \{2, -2\}$

(d) $\mathbb{R}$

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

(a) $\lim_{h \to 0} \dfrac{\cot(x+h) - \cot x}{h}$

(b) $\lim_{h \to 0} \dfrac{\cot x - \cot(x+h)}{h}$

(c) $\lim_{h \to 0} \dfrac{\cot(x+h) + \cot(x+\pi)}{h}$

(d) $\lim_{h \to 0} \dfrac{\cot(x-h) + \cot x}{h}$

20. If $f(x) = \sqrt{x-5}$, then $f(x)$ is not differentiable at $x = 5$

(a) True

(b) False

21. The equation of the tangent line to the curve $y = f(x)$, $f(3) = -1$, $f'(3) = 4$

(a) $y = -4x - 11$

(b) $y = 4x - 11$

(c) $y = 4x - 12$

(d) $y = 4x - 13$

22. $\dfrac{d}{dx} \sin \dfrac{\pi}{4}$

(a) 1

(b) 0

(c) $\cos \dfrac{\pi}{4}$

(d) $-\cos \dfrac{\pi}{4}$

23. The slope of the tangent line to the curve $f(x) = \sqrt{x}(1 + x^3)$ at the point $(1, 0)$ is

(a) -4

(b) -3

(c) 4

(d) 3

24. If $y = 4x^4 + 3x^3 - 8x^2 + 2$, then $y^{(5)} =$

(a) 1

(b) 4

(c) 28

(d) 0

25. If $f(x) = 5ax^2 + 3x$ and $f''(x) = 30$, then $a =$

(a) -3

(b) 3

(c) $-\frac{1}{3}$

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

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

(a) $\frac{2}{9}$

(b) -2

(c) 2

(d) $-\frac{2}{9}$

27. $\frac{d}{dx}\left(\frac{5^x}{\cos x}\right) =$

(a) $\frac{5^x \ (\ln 5 \cos x + \sin x)}{\cos^2 x}$

(b) $\frac{5^x \ (\cos x + \sin x)}{\cos^2 x}$

(c) $\frac{5^x \ (-\sin x - \cos x)}{\cos^2 x}$

(d) $\frac{5^x \ (-\sin x - \ln 5 \cos x)}{\cos^2 x}$

28. The 13^{th} derivative of $\cos x$ 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 $y = -e^{\cot x}$, then $y' =$

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

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

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

(d) $\csc^2 x \; e^{\cot x}$

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

(a) $5(x+\tan x)^4(1-\sec^2 x)$

(b) $5(x+\tan x)^4(1+\sec^2 x)$

(c) $-5(x+\tan x)^4(1+\sec^2 x)$

(d) $-5(x+\tan x)^4(1-\sec^2 x)$

32. If $x^3y^3 = 5$, then $y' =$

(a) $\dfrac{x}{y}$

(b) $\dfrac{y}{x}$

(c) $-\dfrac{x}{y}$

(d) $-\dfrac{y}{x}$

33. $\dfrac{d}{dx}\left(\sec^{-1} x^2\right) = \dfrac{2}{x\sqrt{x^4-1}}$

(a) True

(b) False

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

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

(b) $\dfrac{2(6x + 2)}{3(3x^2 + 2x)^{1/3}}$

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

(d) $\dfrac{2}{3}(3x^2+2x)^{1/3}(6x + 2)$

35. If $y = \ln(\sin x^3)$, then $y' =$

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

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

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

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

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

(a) $(\cos x)^x \ (\ln \cos x - x \tan x)$

(b) $\ln \cos x - x \tan x$

(c) $(\cos x)^x \ln \cos x$

(d) $-x \ (\cos x)^{x-1} \sin x$

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 $f(x) = 2x^2 + 5$ on $[-2, 4]$ are

	Absolute minimum	Absolute maximum
(a)	$f(0)$	$f(-2)$
(b)	$f(4)$	$f(0)$
(c)	$f(0)$	$f(4)$
(d)	$f(-2)$	$f(4)$

39. The value(s) of c that satisfies Roll's theorem for the function $f(x) = 2x^4 - 4x^2$ on $[-1, 1]$ is (are)

(a) 0
(b) -1
(c) 1
(d) 0 , ± 1

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

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

41. If $f''(x) < 0$ for $2 < x < 4$ then the graph of $f(x)$ is concave up on $(2, 4)$

(a) True
(b) False

42. The inflection point of the function $f(x) = \frac{1}{2}x^4 - 16x + 2$ is

(a) $(2, -22)$
(b) $(0, 2)$
(c) $(-2, 42)$
(d) f does not have inflection point

43. $\lim_{x\to\infty} \frac{e^x + 1}{x^2 + 2} =$

(a) 2
(b) 0
(c) ∞
(d) $-\infty$.

44. $\lim_{x\to 0} \frac{1 - \cos x}{4x^2} =$

(a) 0
(b) $-\frac{1}{8}$
(c) 1
(d) $\frac{1}{8}$