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

1. The range of the function $f(x) = \dfrac{x+3}{|\,x+3\,|}$ is

   (a) $\mathbb{R}$
   (b) $\mathbb{R} - \{-3\}$
   (c) $[0\ , \infty\ )$
   (d) $\{-1, 1\}$

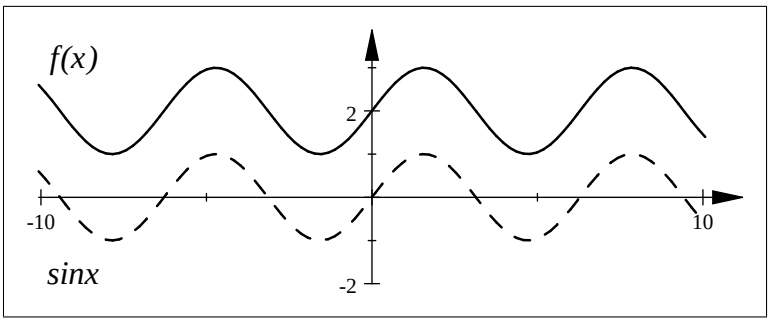
2. The function $f\,(x)$ is an even function if $f\,(-x) = f\,(x)$ for every $x \in D_f$

   (a) True
   (b) False

3. $\cos\ (\dfrac{3\pi}{2} + \pi) = \cos\ \dfrac{3\pi}{2}$

   (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) $f(x) = \sin(x + 2)$
   (b) $f(x) = \sin x + 2$
   (c) $f(x) = \sin(x - 2)$
   (d) $f(x) = \sin x - 2$

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

(a) $\mathbb{R}$

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

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

(d) $(0, \infty)$

6. If $f(x) = e^x - 3$, then $f^{-1}(x) =$

(a) $\ln(x+3)$

(b) $\ln x + 3$

(c) $\ln(x-3)$

(d) $\ln x - 3$

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

(a) True

(b) False

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

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

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

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

(d) $-\dfrac{3}{2}$

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

(a) 1

(b) 4

(c) 2

(d) Does not exist.

10. $\lim_{x\to 2} \dfrac{e^b}{5} =$

(a) 0

(b) $\dfrac{e^b}{5}$

(c) $\dfrac{e^2}{5}$

(d) $\dfrac{2}{5}$

11. If $\lim_{x\to a} f(x) = \dfrac{2}{3}$ and $\lim_{x\to a} g(x) = \dfrac{5}{6}$, then $\lim_{x\to a} \dfrac{f(x)}{g(x)}$

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

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

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

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

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

(a) True

(b) False

13. $\lim_{x\to 0} \dfrac{\sin 7x}{\sin 5x} =$

(a) $\dfrac{5}{7}$

(b) $\dfrac{7}{5}$

(c) 1

(d) Does not exist.

14. The horizontal assymptote(s) of the function $f(x) = \dfrac{\sqrt{4x^2+x}}{2x-1}$ is (are)

(a) $x = 1$

(b) $x = -1$

(c) $y = 1$, $y = -1$

(d) $y = 2$

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

(a) 0

(b) ∞

(c) $-\infty$

(d) -1

16. The vertical asymptote(s) of the curve $y = \dfrac{x-2}{x^2-4}$ is (are)

(a) $y = -2$

(b) $x = 2$, $x = -2$

(c) $x = -2$

(d) $x = 2$

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

(a) $\mathbb{R}$

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

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

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

18. The function $f(x) = \dfrac{3x^2 + 5}{x^2 + 2x + 1}$ is continuous on

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

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

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

(d) $\mathbb{R}$

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

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

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

(c) $\lim_{h \to 0} \dfrac{\cos(x-h) + \cos x}{h}$

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

20. If $f(x) = \sqrt{x+2}$, then $f(x)$ is differentiable at $x = -2$

(a) True

(b) False

21. The equation for the tangent line to the curve $y = f(x)$, $f(-3) = 2$, $f'(-3) = -2$

(a) $y = -2x + 4$

(b) $y = -2x - 4$

(c) $y = 2x + 4$

(d) $y = 2x - 4$

22. $\dfrac{d}{dx} \cos \dfrac{\pi}{4} =$

(a) $\sin \dfrac{\pi}{4}$

(b) $-\sin \dfrac{\pi}{4}$

(c) -1

(d) 0

23. The slope of the tangent line to the curve $f(x) = \sqrt{x}(2x^3 - 10)$ at the point $(1, 0)$ is

(a) 2

(b) 12

(c) -2

(d) 5

24. If $y = 7x^5 + 2x^4 - 8x^2 + 1$, then $y^{(6)} =$

(a) 35

(b) 5

(c) 0

(d) 1

25. If $f(x) = 4ax^2 + 3x$ and $f''(x) = -16$, 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 $\left.\frac{d}{dx}(\frac{f}{g})\right|_{x=2} =$

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

(b) -2

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

(d) $-\frac{1}{8}$

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

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

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

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

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

28. The 15^{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) $y = x - 1$

(d) $y = x + 1$

30. If $y = e^{\tan x}$, then $y' =$

(a) $-\sec^2 x \; e^{\tan x}$

(b) $\tan x \; e^{\sec^2 x}$

(c) $\sec^2 x \; e^{\tan x}$

(d) $-\tan x \; e^{\sec^2 x}$

31. If $y = (x + \cot x)^3$, then $y' =$

(a) $3(x+\cot x)^2(1+\csc^2 x)$

(b) $3(x+\cot x)^2(1-\csc^2 x)$

(c) $-3(x+\cot x)^2(1+\csc^2 x)$

(d) $-3(x+\cot x)^2(1-\csc^2 x)$

32. If $x^2y^2 = 9$, then $y' =$

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

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

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

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

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

(a) True

(b) False

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

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

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

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

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

35. If $f(x) = \ln(\cos x^2)$, then $f'(x) =$

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

(b) $2x \tan x^2$

(c) $2x \cot x^2$

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

36. If $y = x^{\sin x}$, then $y' =$

(a) $\sin x \ (x^{\sin x - 1})$

(b) $\cos x \ln x + \dfrac{\sin x}{x}$

(c) $x^{\sin x} \ (\cos x \ln x + \dfrac{\sin x}{x})$

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

37. The critical numbers of the function $f(x) = x^3 + 3x^2 - 9x$ are

(a) $1 \ , -3$

(b) $-1 \ , 3$

(c) $-1 \ , -3$

(d) $1 \ , 3$

38. The absolute extreme of $f(x) = x^2 - 4x$ on $[1, 5]$ are

	Absolute minimum	absolute maximum
(a)	$f(5)$	$f(2)$
(b)	$f(2)$	$f(5)$
(c)	$f(2)$	$f(1)$
(d)	$f(1)$	$f(5)$

39. The value(s) of c that satisfies Roll's theorem for the function $f(x) = x^3 - 9x$ on $[0, 3]$ is (are)

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

40. The function $f(x) = x^3 - 3x^2$ is increasing on

(a) $(0, 2)$
(b) $(0, \infty)$
(c) $(-\infty, 0) \cup (2, \infty)$
(d) $(2, \infty)$

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

(a) True
(b) False

42. The inflection point of the function $f(x) = x^3 - 3x - 1$ is

(a) $(0, -1)$
(b) $(-1, 1)$
(c) $(1, -3)$
(d) f does not have an inflection point.

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

(a) 2
(b) $-\infty$
(c) ∞
(d) 0

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

(a) $\dfrac{1}{4}$
(b) $-\dfrac{1}{4}$
(c) 0
(d) 1