CUET Mathematics Test

Chapter: Continuity and Differentiability

General Instructions

1. Total Questions: **20**

2. Duration: **60 Minutes**

3. All questions are compulsory.

4. Each question carries **5 marks**.

5. For each correct answer: **+5 marks**.

6. For each incorrect answer: **-1 mark**.

7. No negative marking for unanswered questions.

8. Use of calculator or electronic devices is strictly prohibited.

9. Choose the most appropriate answer from the given options.

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1. Let $f(x) = |x-1|+|x-2|$. At which of the following points is the function not differentiable?
   (A) $x = 1$ only
   (B) $x = 2$ only
   (C) $x = 1$ and $x = 2$
   (D) All real values of x

2. If $y = \tan^{-1}\left(\frac{\sin x + \cos x}{\cos x - \sin x}\right)$, then dy/dx is:
   (A) $1/2$
   (B) 0
   (C) 1
   (D) -1

3. If $x = a(\theta + \sin\theta)$ and $y = a(1 - \cos\theta)$, then dy/dx at $\theta = \pi/2$ is:
   (A) 1
   (B) 0
   (C) -1
   (D) $1/2$

4. If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \ldots \infty}}}$, then dy/dx is equal to:
   (A) $\frac{\cos x}{2y-1}$
   (B) $\frac{\sin x}{2y-1}$
   (C) $\frac{\cos x}{y-1}$
   (D) $\frac{\sin x}{y-1}$

5. The derivative of $\sin^{-1}(2x\sqrt{1-x^2})$ with respect to $\cos^{-1}(1-2x^2)$ for $0 < x < 1/\sqrt{2}$ is:
   (A) 1
   (B) 2
   (C) $1/2$
   (D) 0

6. If $y = e^{x+e^{x+e^{x+\ldots\infty}}}$, then dy/dx is:
   (A) $\frac{y}{1-y}$
   (B) $\frac{1}{1-y}$
   (C) $\frac{y}{y-1}$
   (D) $\frac{e^x}{y}$

7. If $f(x) = \log_x(\log_e x)$, then $f'(x)$ at $x = e$ is:
   (A) e
   (B) $1/e$
   (C) 1
   (D) 0

8. If $x^y = e^{x-y}$, then dy/dx is equal to:
   (A) $\frac{\log x}{(1+\log x)^2}$
   (B) $\frac{1}{(1+\log x)^2}$
   (C) $\frac{\log x}{1+\log x}$
   (D) $\frac{e^x}{x^y}$

9. If $y = \sin^{-1} x$, then $(1 - x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx}$ is:
   (A) 1
   (B) y

(C) 0

(D) −1

10. The function $f(x) = [x]$ (where $[x]$ is the greatest integer function) is:
    (A) Continuous at $x = 1$
    (B) Differentiable at $x = 1$
    (C) Continuous but not differentiable at $x = 1.5$
    (D) Differentiable at $x = 1.5$

11. If $y = \log \sqrt{\frac{1-\cos x}{1+\cos x}}$, then dy/dx is:
    (A) $\sec x$
    (B) $\cos x$
    (C) $\csc x$
    (D) $\tan x$

12. If $x = at^2$ and $y = 2at$, then $\frac{d^2y}{dx^2}$ is:
    (A) $-1/t^2$
    (B) $1/(2at^3)$
    (C) $-1/(2at^3)$
    (D) $-1/(2at^2)$

13. The derivative of $e^{\sin x}$ with respect to $\cos x$ is:
    (A) $-e^{\sin x} \cot x$
    (B) $e^{\sin x} \tan x$
    (C) $-e^{\sin x} \tan x$
    (D) $e^{\sin x} \cot x$

14. If $y = \tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$, then dy/dx is:
    (A) $\frac{1}{2(1+x^2)}$
    (B) $\frac{1}{1+x^2}$
    (C) $\frac{2}{1+x^2}$
    (D) $\frac{x}{1+x^2}$

15. If $f(x) = e^x g(x)$, $g(0) = 2$ and $g'(0) = 1$, then $f'(0)$ is:
    (A) 1
    (B) 3
    (C) 2
    (D) 0

16. If $y = (\sin x)^x$, then dy/dx is:
    (A) $(\sin x)^x[x \cot x + \log \sin x]$
    (B) $(\sin x)^x[x \tan x + \log \sin x]$
    (C) $x(\sin x)^{x-1} \cos x$
    (D) $(\sin x)^x \log \sin x$

17. If $x^m y^n = (x + y)^{m+n}$, then dy/dx is always:
    (A) x/y
    (B) y/x
    (C) m/n
    (D) n/m

18. For the function $f(x) = e^{|x|}$, the derivative at $x = 0$:
    (A) is 1
    (B) is −1

(C) is 0

(D) Does not exist

19. If $y = \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$, then dy/dx is:

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

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

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

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

20. If $f(x) = \sin x + \cos x$, then the value of the second order derivative at $x = \pi/4$ is:

   (A) $\sqrt{2}$

   (B) 0

   (C) $-\sqrt{2}$

   (D) 1

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