NDA 2 2024

LIVE

MATHS

DIFFERENTIATION

CLASS 2

NAVJYOTI SIR

Crack
EXAMS

24 June 2024 Live Classes Schedule

8:00AM	24 JUNE 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	24 JUNE 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:00AM	MOCK PERSONAL INTERVIEW	ANURADHA MA'AM

AFCAT 2 2024 LIVE CLASSES

2:30PM	STATIC GK - IMPORTANT STRAITS & INTERNATIONAL BORDERS	DIVYANSHU SIR
4:00PM	MATHS - SET THEORY	NAVJYOTI SIR
5:30PM	ENGLISH - WORD SUBSTITUTION - CLASS 2	ANURADHA MA'AM

NDA 2 2024 LIVE CLASSES

11:30AM	GK - ANCIENT HISTORY - CLASS 3	RUBY MA'AM
2:30PM	GS - CHEMISTRY MCQS - CLASS 1	SHIVANGI MA'AM
6:30PM	MATHS - DIFFERENTIATION - CLASS 2	NAVJYOTI SIR

CDS 2 2024 LIVE CLASSES

11:30AM	GK - ANCIENT HISTORY - CLASS 3	RUBY MA'AM
2:30PM	GS - CHEMISTRY MCQS - CLASS 1	SHIVANGI MA'AM
4:00PM	MATHS - SET THEORY	NAVJYOTI SIR

Q) What is the derivative of $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ with respect to $\tan^{-1}x$?

(a) 0

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

(c) 1

(d) x

$\frac{du}{dt} = \frac{1}{2}$

$x = \tan\theta$

$\tan^{-1}\left(\frac{\sec\theta - 1}{\tan\theta}\right) = u$

$\tan^{-1}\left(\frac{1-\cos\theta}{\sin\theta}\right)$

$\tan^{-1}\left(\frac{2\sin^2\theta/2}{2\sin\theta/2\cos\theta/2}\right)$

$\tan^{-1}\left(\tan\frac{\theta}{2}\right)$

$= \frac{\theta}{2} \Rightarrow \frac{1}{2}(\tan^{-1}x) = \frac{1}{2}t = u$

Q) What is the derivative of $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ with respect to $\tan^{-1} x$?

(a) 0

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

(c) 1

(d) x

Ans: (b)

Q) **DIRECTIONS (Qs. 65-67) :** *For the next two (02) items that follow :*

Consider the curve $x = a(\cos\theta + \theta\sin\theta)$ and $y = a(\sin\theta - \theta\cos\theta)$.

What is $\frac{dy}{dx}$ equal to ?

(a) $\tan\theta$ (b) $\cot\theta$

(c) $\sin 2\theta$ (d) $\cos 2\theta$

$$\frac{dy}{dx} = \frac{\frac{dy}{d\theta}}{\frac{dx}{d\theta}} = \tan\theta$$

$$\frac{dy}{d\theta} = a\left[\cos\theta - (\theta(-\sin\theta) + \cos\theta)\right] = a\theta\sin\theta$$

$$\frac{dx}{d\theta} = a\left(-\sin\theta + \theta\cos\theta + \sin\theta\right) = a\theta\cos\theta$$

Q) **DIRECTIONS (Qs. 65-67) :** *For the next two (02) items that follow* **:**

Consider the curve $x = a(\cos\theta + \theta\sin\theta)$ and $y = a(\sin\theta - \theta\cos\theta)$.

What is $\frac{dy}{dx}$ equal to ?

(a) $\tan\theta$ (b) $\cot\theta$

(c) $\sin 2\theta$ (d) $\cos 2\theta$

Ans: (a)

Q) What is $\frac{d^2y}{dx^2}$ equal to ?

(a) $\sec^2\theta$

(b) $-\operatorname{cosec}^2\theta$

(c) $\frac{\sec^3\theta}{a\theta}$

(d) None of these

$\frac{dy}{dx} = \tan\theta$ ✓

$\frac{d\theta}{dx} = \frac{1}{\left(\frac{dx}{d\theta}\right)}$

$= \frac{1}{a\theta\cos\theta}$

$\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right) = \sec^2\theta \cdot \left(\frac{d\theta}{dx}\right) = \sec^2\theta \cdot \left(\frac{1}{a\theta\cos\theta}\right) = \left(\frac{\sec^3\theta}{a\theta}\right)$

$=$

Q) What is $\frac{d^2y}{dx^2}$ equal to ?

(a) $\sec^2 \theta$

(b) $-\operatorname{cosec}^2 \theta$

(c) $\frac{\sec^3 \theta}{a\theta}$

(d) None of these

Ans: (c)

Q) The derivative of $\sec^2 x$ with respect to $\tan^2 x$ is

(a) 1 (b) 2

(c) $2 \sec x \tan x$ (d) $2 \sec^2 x \tan x$

v u

$$\frac{dv}{du} = \frac{\frac{dv}{dx}}{\frac{du}{dx}} = \frac{2\sec x(\sec x \tan x)}{2\tan x(\sec^2 x)} = 1$$

Q) The derivative of $\sec^2 x$ with respect to $\tan^2 x$ is

(a) 1 (b) 2

(c) $2 \sec x \tan x$ (d) $2 \sec^2 x \tan x$

Ans: (a)

Q) If $y = \ell n\,(e^{mx} + e^{-mx})$, then what is $\frac{dy}{dx}$ at $x = 0$ equal to?

(a) -1 (b) 0
(c) 1 (d) 2

$$\frac{dy}{dx} = \frac{1}{e^{mx}+e^{-mx}}\left(me^{mx} - me^{-mx}\right)$$

$$= \frac{m}{e^{mx}+e^{-mx}}\left(e^{mx} - e^{-mx}\right) = \frac{m(1-1)}{1+1} = 0$$

(At $x = 0$)

Q) If $y = \ell n\,(e^{mx} + e^{-mx})$, then what is $\frac{dy}{dx}$ at $x = 0$ equal to ?

(a) -1 (b) 0

(c) 1 (d) 2

Ans: (b)

Q) If $y = \sec(\tan^{-1} x)$, then $\frac{dy}{dx}$ at $x = 1$ is equal to

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

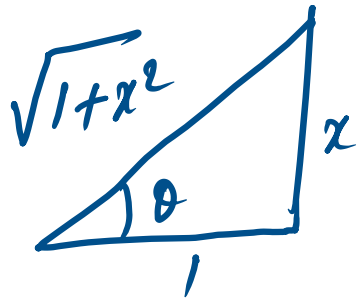
$$\frac{dy}{dx} = \left[\sec(\tan^{-1}x)\, x\right] \times \frac{1}{1+x^2}$$

$$= \left[\sec\left(\frac{\pi}{4}\right) \times 1 \times \frac{1}{1+1}\right] = \frac{1}{2} \times \frac{1}{\cos\frac{\pi}{4}} = \frac{1}{2} \times \sqrt{2} = \frac{1}{\sqrt{2}}$$

(OR)

$$\sec\left(\sec^{-1}\left(\sqrt{1+x^2}\right)\right) x \times \frac{1}{1+x^2}$$

$$= \sqrt{2} \times \frac{1}{2} = \frac{1}{\sqrt{2}} //$$



Q) If $y = \sec(\tan^{-1} x)$, then $\frac{dy}{dx}$ at $x = 1$ is equal to

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

Ans: (a)

SSBCrack EXAMS

Q) What is the derivative of

$$y = (\log_{\tan x} \cot x)(\log_{\cot x} \tan x)^{-1} \text{ at } x = \frac{\pi}{4}?$$

(a) -1 (b) 0

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

$$\log_b a = \frac{\log_m a}{\log_m b}$$

$$\log a^m = m \log a$$

$$\left(\frac{\log_e \cot x}{\log_e \tan x}\right)\left(\frac{\log_e \tan x}{\log_e \cot x}\right)^{-1}$$

$$\left(\frac{\ln \cot x}{\ln \tan x}\right)^2 = \left[\frac{\left(\ln \frac{1}{\tan x}\right)}{\ln \tan x}\right]^2$$

$$\left[\frac{\ln (\tan x)^{-1}}{\ln \tan x}\right]^2$$

$$\left[-\frac{\ln \tan x}{\ln \tan x}\right]^2$$

$$= (-1)^2 = 1 = y$$

$$\frac{dy}{dx} = 0$$

Q) What is the derivative of

$(\log_{\tan x} \cot x)\,(\log_{\cot x} \tan x)^{-1}$ at $x = \frac{\pi}{4}$?

(a) -1 (b) 0

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

Ans: (b)

Q) If $f(1)=1$, $f'(1)=3$, then the derivative of $f(f(f(x)))+(f(x))^2$ at $x=1$ is

(a) 12 (b) 9 (c) 15 (d) 33

$f(f(f(x)))+(f(x))^2$

$f'(f(f(x)))\cdot f'(f(x))\cdot f'(x)+2f(x)\cdot f'(x)$ = derivative

$f'(f(f(1)))\cdot f'(f(1))\cdot f'(1)+2f(1)\cdot f'(1)$

$3\cdot 3\cdot 3+2\cdot 3=27+6=33$

Q) If $f(1)=1$, $f'(1)=3$, then the derivative of $f(f(f(x)))+(f(x))^2$ at $x=1$ is

(a) 12 (b) 9 (c) 15 (d) 33

Ans: (d)

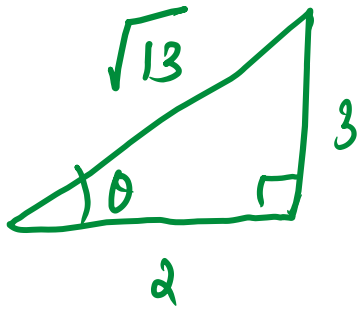
SSBCrack EXAMS

Q) What is the derivative of $\cos^{-1}\left(\frac{2\cos x + 3\sin x}{\sqrt{13}}\right)$?

$\frac{2}{\sqrt{13}}\cos x + \frac{3}{\sqrt{13}}\sin x$

(a) $\frac{1}{\sqrt{1-x^2}}$ (b) $-\frac{1}{\sqrt{1-x^2}}$

(c) 0 (d) 1



$\cos\theta = \frac{2}{\sqrt{13}}$; $\sin\theta = \frac{3}{\sqrt{13}}$

$\theta = \cos^{-1}\left(\frac{2}{\sqrt{13}}\right)$ / $\sin^{-1}\left(\frac{3}{\sqrt{13}}\right)$

$\cos\theta\cos x + \sin\theta\sin x$

$= \cos(\theta - x)$ -

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

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

$= x - \theta =$ / $\frac{1}{-x}$

Q) What is the derivative of $\cos^{-1}\left(\frac{2\cos x + 3\sin x}{\sqrt{13}}\right)$?

(a) $\frac{1}{\sqrt{1-x^2}}$

(b) $-\frac{1}{\sqrt{1-x^2}}$

(c) 0

(d) 1

Ans: (d)

$\cot^{-1}x = \tan^{-1}\left(\frac{1}{x}\right)$

Q) If $f(x) = \cot^{-1}\left(\frac{x^x - x^{-x}}{2}\right)$, then $f'(1)$ is equal to

(a) -1 (b) 1

(c) $\log 2$ (d) $-\log 2$

$f(x) = -2\tan^{-1}x^x$

$f'(x) = -2\left(\frac{1}{1+x^{2x}}\right)(1+\log x)x^x$

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

$f'(1) = -2\left(\frac{1}{1+1}\right)1$

$f'(1) = -1$

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

Let $x^x = \tan\theta$

$\theta = \tan^{-1}(x^x)$

$f(x) = \tan^{-1}\left(-\frac{(1-\tan^2\theta)}{2\tan\theta}\right)^{-1}$

$= \tan^{-1}\left(-\frac{2\tan\theta}{1-\tan^2\theta}\right)$ $\{(\tan^{-1}(-x) = -\tan^{-1}x\}$

$= -\tan^{-1}(\tan 2\theta)$

$= -2\theta$

Q) If $f(x) = \cot^{-1}\left(\frac{x^x - x^{-x}}{2}\right)$, then $f'(1)$ is equal to

(a) -1
(b) 1
(c) $\log 2$
(d) $-\log 2$

Ans: (a)

Q) What is the derivative of $f(x) = x|x|$?

(a) $|x|+x$ (b) $2x$

(c) $2|x|$ (d) $-2|x|$

$$\frac{d}{dx}(|x|) = \frac{|x|}{x}$$

$$f'(x) = x\left(\frac{|x|}{x}\right) + |x| \cdot 1$$

$$= |x| + |x| = 2|x|$$

Q) What is the derivative of $f(x) = x|x|$?

(a) $|x|+x$ (b) $2x$

(c) $2|x|$ (d) $-2|x|$

Ans: (c)

SSBCrack EXAMS

Q) If y is a function of x and $\log(x+y) = 2xy$, then the value of $y'(0)$ is

(a) 1 (b) -1 (c) 2 (d) 0

At $x = 0$

$\log(x+y) = 2xy$

$\frac{1}{x+y}(1 + y'(x)) = 2(y + xy'(x))$

$y'(x) = \frac{1}{x+y} - 2y \;/\; 2x - \frac{1}{x+y}$

$y'(x) = 1 - 2xy - 2y^2 \;/\; 2x^2 + 2xy - 1$

$\log(0+y) = 0$

$\log y = 0 \Rightarrow y = 1$ (for $x = 0$)

$y'(0) = \frac{1 - 2y^2}{-1} = \frac{2y^2 - 1}{1}$

$f'(0) = 2f(x)^2 - 1$

$f'(0) = 2(f(0))^2 - 1$

$f'(0) = 2(1)^2 - 1$

$= 2 - 1$

$= 1$

Q) If y is a function of x and $\log(x + y) = 2xy$, then the value of $y'(0)$ is

(a) 1 (b) -1 (c) 2 (d) 0

Ans: (a)

Q) If $x^2 + y^2 = 1$, then

(a) $yy'' - 2(y')^2 + 1 = 0$

(b) $yy'' + (y')^2 + 1 = 0$

(c) $yy'' + (y')^2 - 1 = 0$

(d) $yy'' + 2(y')^2 + 1 = 0$

Q) If $x^2 + y^2 = 1$, then

(a) $yy'' - 2(y')^2 + 1 = 0$

(b) $yy'' + (y')^2 + 1 = 0$

(c) $yy'' + (y')^2 - 1 = 0$

(d) $yy'' + 2(y')^2 + 1 = 0$

Ans: (d)

Q) $\frac{d}{dx}\left[\sin^{-1}\left(x\sqrt{1-x}-\sqrt{x}\sqrt{1-x^2}\right)\right]$ is equal to

(a) $\frac{1}{2\sqrt{x(1-x)}}-\frac{1}{\sqrt{1-x^2}}$

(b) $\frac{1}{\sqrt{1-\left\{x\sqrt{1-x}-\sqrt{x(1-x^2)}\right\}^2}}$

(c) $\frac{1}{\sqrt{1-x^2}}-\frac{1}{2\sqrt{x(1-x)}}$

(d) $\frac{1}{\sqrt{x(1-x)(1-x)^2}}$

Q) $\frac{d}{dx}\left[\sin^{-1}\left(x\sqrt{1-x}-\sqrt{x}\sqrt{1-x^2}\right)\right]$ is equal to

(a) $\frac{1}{2\sqrt{x(1-x)}}-\frac{1}{\sqrt{1-x^2}}$

(b) $\frac{1}{\sqrt{1-\left\{x\sqrt{1-x}-\sqrt{x(1-x^2)}\right\}^2}}$

(c) $\frac{1}{\sqrt{1-x^2}}-\frac{1}{2\sqrt{x(1-x)}}$

(d) $\frac{1}{\sqrt{x(1-x)(1-x)^2}}$

Ans: (c)

Q) What is the derivative of $\tan^{-1}\left(\frac{\sqrt{x}-x}{1+x^{3/2}}\right)$ at $x=1$?

(a) $-\frac{1}{4}$

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

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

(d) 1

SSBCrack EXAMS

Q) What is the derivative of $\tan^{-1}\left(\frac{\sqrt{x}-x}{1+x^{3/2}}\right)$ at $x=1$?

(a) $-\frac{1}{4}$

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

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

(d) 1

Ans: (a)

Q) The derivative of $y = a^{x \log_a \sin x}$ is equal to

(a) $\log \sin x + x \tan x$

(b) $\log \sin x + x \cot x$

(c) $y \log (\sin x \, e^{x \cot x})$

(d) $y \log (\sin x \, e^{x \tan x})$

Q) The derivative of $y = a^{x \log_a \sin x}$ is equal to

(a) $\log \sin x + x \tan x$

(b) $\log \sin x + x \cot x$

(c) $y \log (\sin x \, e^{x \cot x})$

(d) $y \log (\sin x \, e^{x \tan x})$

Ans: (c)

Q) What is the derivative of $2^{(\sin x)^2}$ with respect to $\sin x$?

(a) $\sin x \, 2^{(\sin x)^2} \ln 4$

(b) $2 \sin x \, 2^{(\sin x)^2} \ln 4$

(c) $\ln (\sin x) \, 2^{(\sin x)^2}$

(d) $2 \sin x \cos x \, 2^{(\sin x)^2}$

Q) What is the derivative of $2^{(\sin x)^2}$ with respect to $\sin x$?

(a) $\sin x\, 2^{(\sin x)^2} \ln 4$

(b) $2 \sin x\, 2^{(\sin x)^2} \ln 4$

(c) $\ln (\sin x)\, 2^{(\sin x)^2}$

(d) $2 \sin x \cos x\, 2^{(\sin x)^2}$

Ans: (a)

Q) The derivative of $\ln(x+\sin x)$ with respect to $(x+\cos x)$ is

(a) $\dfrac{1+\cos x}{(x+\sin x)(1-\sin x)}$

(b) $\dfrac{1-\cos x}{(x+\sin x)(1+\sin x)}$

(c) $\dfrac{1-\cos x}{(x-\sin x)(1+\cos x)}$

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

Q) The derivative of $\ln(x+\sin x)$ with respect to $(x+\cos x)$ is

(a) $\dfrac{1+\cos x}{(x+\sin x)(1-\sin x)}$ (b) $\dfrac{1-\cos x}{(x+\sin x)(1+\sin x)}$

(c) $\dfrac{1-\cos x}{(x-\sin x)(1+\cos x)}$ (d) $\dfrac{1+\cos x}{(x-\sin x)(1-\cos x)}$

Ans: (a)

Q) If $y = \cot^{-1}\left[\frac{\sqrt{1+\sin x}+\sqrt{1-\sin x}}{\sqrt{1+\sin x}-\sqrt{1-\sin x}}\right]$, where $0 < x < \frac{\pi}{2}$, then

$\frac{dy}{dx}$ is equal to

(a) $\frac{1}{2}$ (b) 2

(c) $\sin x + \cos x$ (d) $\sin x - \cos x$

Q) If $y = \cot^{-1}\left[\frac{\sqrt{1+\sin x}+\sqrt{1-\sin x}}{\sqrt{1+\sin x}-\sqrt{1-\sin x}}\right]$, where $0 < x < \frac{\pi}{2}$, then

$\frac{dy}{dx}$ is equal to

(a) $\frac{1}{2}$ (b) 2

(c) $\sin x + \cos x$ (d) $\sin x - \cos x$

Ans: (a)

Q) If $y = \tan^{-1}\left(\frac{5-2\tan\sqrt{x}}{2+5\tan\sqrt{x}}\right)$, then what is $\frac{dy}{dx}$ equal to?

(a) $-\frac{1}{2\sqrt{x}}$

(b) 1

(c) -1

(d) $\frac{1}{2\sqrt{x}}$

Q) If $y = \tan^{-1}\left(\frac{5-2\tan\sqrt{x}}{2+5\tan\sqrt{x}}\right)$, then what is $\frac{dy}{dx}$ equal to?

(a) $-\frac{1}{2\sqrt{x}}$

(b) 1

(c) -1

(d) $\frac{1}{2\sqrt{x}}$

Ans: (a)

Q) If $y = \sin(ax + b)$, then what is $\frac{d^2y}{dx^2}$ at $x = -\frac{b}{a}$, where a, b are constants and $a \neq 0$?

(a) 0
(b) –1
(c) $\sin(a - b)$
(d) $\sin(a + b)$

Q) If $y = \sin(ax + b)$, then what is $\frac{d^2y}{dx^2}$ at $x = -\frac{b}{a}$, where a, b are constants and $a \neq 0$?

(a) 0 (b) –1

(c) $\sin(a - b)$ (d) $\sin(a + b)$

Ans: (a)

Q) Let $g(x) = x^3 - 4x + 6$. If $f'(x) = g'(x)$ and $f(1) = 2$, then what is $f(x)$ equal to?

(a) $x^3 - 4x + 3$

(b) $x^3 - 4x + 6$

(c) $x^3 - 4x + 1$

(d) $x^3 - 4x + 5$

Q) Let $g(x) = x^3 - 4x + 6$. If $f'(x) = g'(x)$ and $f(1) = 2$, then what is $f(x)$ equal to?

(a) $x^3 - 4x + 3$

(b) $x^3 - 4x + 6$

(c) $x^3 - 4x + 1$

(d) $x^3 - 4x + 5$

Ans: (d)

Q) Consider the following statements :

1. If $y = \ell n(\sec x + \tan x)$, then $\frac{dy}{dx} = \sec x$.

2. If $y = \ell n(\operatorname{cosec} x - \cot x)$, then $\frac{dy}{dx} = \operatorname{cosec} x$.

Which of the above is/are correct?

(a) 1 only (b) 2 only

(c) Both 1 and 2 (d) Neither 1 nor 2

Q) Consider the following statements :

1. If $y = \ell n(\sec x + \tan x)$, then $\frac{dy}{dx} = \sec x$.

2. If $y = \ell n(\text{cosec } x - \cot x)$, then $\frac{dy}{dx} = \text{cosec } x$.

Which of the above is/are correct?

(a) 1 only (b) 2 only

(c) Both 1 and 2 (d) Neither 1 nor 2

Ans: (c)

Q) If $x^m + y^m = 1$ such that $\frac{dy}{dx} = -\frac{x}{y}$, then what should be the value of m ?

(a) 0
(b) 1
(c) 2
(d) None of the above

Q) If $x^m + y^m = 1$ such that $\frac{dy}{dx} = -\frac{x}{y}$, then what should be the value of m ?

(a) 0 (b) 1

(c) 2 (d) None of the above

Ans: ()

Q) If $y = x^x$, what is $\frac{dy}{dx}$ at $x = 1$ equal to ?

(a) 0 (b) 1

(c) -1 (d) 2

Q) If $y = x^x$, what is $\frac{dy}{dx}$ at $x = 1$ equal to ?

(a) 0 (b) 1

(c) -1 (d) 2

Ans: (b)

Q) What is the derivative of $\tan^{-1}\left(\frac{\sqrt{x}-x}{1+x^{3/2}}\right)$ at $x=1$?

(a) $-\frac{1}{4}$

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

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

(d) 1

Q) What is the derivative of $\tan^{-1}\left(\frac{\sqrt{x}-x}{1+x^{3/2}}\right)$ at $x=1$?

(a) $-\frac{1}{4}$ (b) $\frac{1}{2}$

(c) $\frac{3}{2}$ (d) 1

Ans: (a)

Q) If $y = f(x)$, $p = \frac{dy}{dx}$ and $q = \frac{d^2y}{dx^2}$, then what is $\frac{d^2x}{dy^2}$ equal to ?

(a) $-\frac{q}{p^2}$

(b) $-\frac{q}{p^3}$

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

(d) $\frac{q}{p^2}$

Q) If $y = f(x)$, $p = \frac{dy}{dx}$ and $q = \frac{d^2y}{dx^2}$, then what is $\frac{d^2x}{dy^2}$ equal to ?

(a) $-\frac{q}{p^2}$

(b) $-\frac{q}{p^3}$

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

(d) $\frac{q}{p^2}$

Ans: (b)

Q) If $y = \sin^{-1}x + \sin^{-1}\sqrt{1-x^2}$, what is $\frac{dy}{dx}$ equal to ?

(a) $\cos^{-1}x + \cos^{-1}\sqrt{1-x^2}$ (b) $\frac{1}{\cos x} + \frac{1}{\cos\sqrt{1-x^2}}$

(c) $\frac{\pi}{2}$ (d) 0

Q) If $y = \sin^{-1}x + \sin^{-1}\sqrt{1-x^2}$, what is $\frac{dy}{dx}$ equal to ?

(a) $\cos^{-1}x + \cos^{-1}\sqrt{1-x^2}$ (b) $\frac{1}{\cos x} + \frac{1}{\cos\sqrt{1-x^2}}$

(c) $\frac{\pi}{2}$ (d) 0

Ans: (d)

Q) If $f(x)=\sqrt{x+\sqrt{x+\sqrt{x+\sqrt{\ldots\infty}}}}$, then what is the value of $f'(x)$?

(a) $\dfrac{1}{1-2f(x)}$

(b) $\dfrac{1}{2f(x)-1}$

(c) $\dfrac{1}{1+2f(x)}$

(d) $\dfrac{1}{2+f(x)}$

Q) If $f(x)=\sqrt{x+\sqrt{x+\sqrt{x+\sqrt{\ldots\infty}}}}$, then what is the value of $f'(x)$?

(a) $\dfrac{1}{1-2f(x)}$

(b) $\dfrac{1}{2f(x)-1}$

(c) $\dfrac{1}{1+2f(x)}$

(d) $\dfrac{1}{2+f(x)}$

Ans: (a)

Q) If $y = \tan^{-1}\left(\frac{a\cos x - b\sin x}{b\cos x + a\sin x}\right)$, then $\frac{dy}{dx}$ is equal to

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

Q) If $y = \tan^{-1}\left(\frac{a\cos x - b\sin x}{b\cos x + a\sin x}\right)$, then $\frac{dy}{dx}$ is equal to

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

Ans: (b)

Q) If $f(x) = \cot^{-1}\left(\frac{x^x - x^{-x}}{2}\right)$, then $f'(1)$ is equal to

(a) -1

(b) 1

(c) $\log 2$

(d) $-\log 2$

Q) If $f(x) = \cot^{-1}\left(\frac{x^x - x^{-x}}{2}\right)$, then $f'(1)$ is equal to

(a) -1 (b) 1

(c) $\log 2$ (d) $-\log 2$

Ans: (a)

Q) What is the derivative of $\sin^{-1}\left(\frac{t}{\sqrt{1+t^2}}\right)$ *wrt* $\cos^{-1}\left(\frac{1}{\sqrt{1+t^2}}\right)$?

(a) 1
(b) –1
(c) 2
(d) –2

Q) What is the derivative of $\sin^{-1}\left(\frac{t}{\sqrt{1+t^2}}\right)$ *wrt* $\cos^{-1}\left(\frac{1}{\sqrt{1+t^2}}\right)$?

(a) 1
(b) –1
(c) 2
(d) –2

Ans: (a)

Q) If $y = \log_{10} x + \log_x 10 + \log_x x + \log_{10} 10$ then what is $\left(\frac{dy}{dx}\right)_{x=10}$ equal to?

(a) 10
(b) 2
(c) 1
(d) 0

Q) If $y = \log_{10} x + \log_x 10 + \log_x x + \log_{10} 10$ then what is $\left(\frac{dy}{dx}\right)_{x=10}$ equal to?

(a) 10
(b) 2
(c) 1
(d) 0

Ans: (d)

Q) If $y = (\cos x)^{(\cos x)^{(\cos x)^{\infty}}}$, then $\frac{dy}{dx}$ is equal to

(a) $-\frac{y^2 \tan x}{1 - y \ln(\cos x)}$

(b) $\frac{y^2 \tan x}{1 + y \ln(\cos x)}$

(c) $\frac{y^2 \tan x}{1 - y \ln(\sin x)}$

(d) $\frac{y^2 \sin x}{1 + y \ln(\sin x)}$

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(c) $\frac{y^2 \tan x}{1 - y \ln(\sin x)}$

(d) $\frac{y^2 \sin x}{1 + y \ln(\sin x)}$

Ans: (a)

Q) Consider the following statements :

1. Derivative of $f(x)$ may not exist at some point.
2. Derivative of $f(x)$ may exist finitely at some point.
3. Derivative of $f(x)$ may be infinite (geometrically) at some point.

Which of the above statements are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

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1. Derivative of $f(x)$ may not exist at some point.
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Which of the above statements are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Ans: (d)

Q) The set of all points, where the function $f(x) = \sqrt{1 - e^{-x^2}}$ is differentiable, is

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

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

Ans: (c)

Q) If $u = \sin^{-1}(x - y), x = 3t, y = 4t^3$, then what is the derivative of u *wrt* t?

(a) $3(1 - t^2)$

(b) $3(1 - t^2)^{-\frac{1}{2}}$

(c) $5(1 - t^2)^{\frac{1}{2}}$

(d) $5(1 - t^2)$

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(c) $5(1 - t^2)^{\frac{1}{2}}$

(d) $5(1 - t^2)$

Ans: (b)

Q) What is the derivative of $\tan^{-1} x$ with respect to $\cot^{-1} x$?

(a) -1

(b) 1

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

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

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(a) -1

(b) 1

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

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

Ans: (b)

Q) If $x^2 + y^2 = t + \frac{1}{t}$, $x^4 + y^4 = t^2 + \frac{1}{t^2}$, then what is the value of $-x^3 y \frac{dy}{dx}$?

(a) $\frac{1}{4}$

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

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

(d) 1

Q) If $x^2 + y^2 = t + \frac{1}{t}$, $x^4 + y^4 = t^2 + \frac{1}{t^2}$, then what is the value of $-x^3 y \frac{dy}{dx}$?

(a) $\frac{1}{4}$

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

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

(d) 1

Ans: (d)

Q) If $f(x) = e^x$ and $g(x) = \log x$, then what is the value of $(gof)'(x)$?

(a) 0 (b) 1

(c) e (d) None of these

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(a) 0 (b) 1

(c) e (d) None of these

Ans: (b)

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MATHS

APPLICATIONS OF DERIVATIVES

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