NDA 2 2024

LIVE

MATHS REVISION

CLASS 11

NAVJYOTI SIR

SSBCrack EXAMS

21 August 2024 Live Classes Schedule

8:00AM	21 AUGUST 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	21 AUGUST 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

NDA 2 2024 LIVE CLASSES

11:00AM	GK - ECONOMICS REVISION - CLASS 2	RUBY MA'AM
1:00PM	MATHS REVISION - CLASS 11	NAVJYOTI SIR
2:00PM	CHEMISTRY REVISION - CLASS 4	SHIVANGI MA'AM

CDS 2 2024 LIVE CLASSES

11:00AM	GK - ECONOMICS REVISION - CLASS 2	RUBY MA'AM
2:00PM	CHEMISTRY REVISION - CLASS 4	SHIVANGI MA'AM
3:00PM	MATHS REVISION - CLASS 11	NAVJYOTI SIR

REVISION TOPICS :

- Differentiability and Differentiation

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

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

$x = \tan\theta \longrightarrow \theta = \tan^{-1}x$

$\frac{d}{d\theta}\left(\frac{\theta}{2}\right) = \frac{1}{2}$

$\frac{\sqrt{1+\tan^2\theta}-1}{\tan\theta} = \frac{\sec\theta - 1}{\tan\theta}$

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

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) $\cos 2\theta$

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

$$= \tan\theta$$

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

$$\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right) = \frac{d}{dx}(\tan\theta)$$

(chain rule)

$$= \frac{d}{d\theta}(\tan\theta) \times \frac{d\theta}{dx} = \sec^2\theta \times \frac{1}{\left(\frac{dx}{d\theta}\right)}$$

$$= \sec^2\theta \times \frac{1}{a\theta\cos\theta} = \left(\frac{\sec^3\theta}{a\theta}\right)$$

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) $2 \sec^2 x \tan x$

$u = \sec^2 x$ $\quad \frac{du}{dv} = ?$

$v = \tan^2 x$

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

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

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

At $x = 0$

$$= \frac{1}{2} \times \left(m(1) - m(1)\right) = \frac{1}{2} \times 0 = 0$$

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

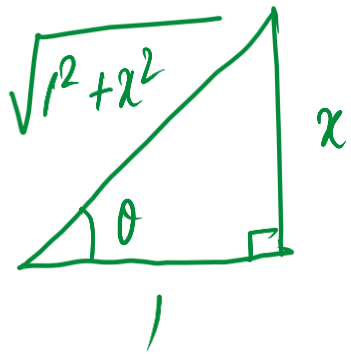
(a) -1 (b) 0

(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) $\sqrt{2}$



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

$\tan\theta = x$

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

$\sec\theta = \frac{\sqrt{1+x^2}}{1}$

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

$y = \sqrt{1+x^2}$

$\frac{dy}{dx} = \frac{1}{2\sqrt{1+x^2}}(0+2x)$

$\frac{dy}{dx} = \frac{x}{\sqrt{1+x^2}}$

At $x = 1$,

$\frac{dy}{dx} = \frac{1}{\sqrt{1+1^2}}$

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

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

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

(a) -1 (b) 0

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

$y = 1$

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

$y = \frac{\log \cot x}{\log \tan x} \times \frac{1}{\log_{\cot x} \tan x}$

$y = \left(\frac{\log \cot x}{\log \tan x}\right)^2 = 1$

$\frac{\log\left(\frac{1}{\tan x}\right)}{\log \tan x} = \frac{\log 1 - \log \tan x}{\log \tan x} = \frac{0 - \log \tan x}{\log \tan x}$

$= -1$ //

Q) What is the derivative of

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

(a) -1 (b) 0

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

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

y

$f'f(f(x)) \cdot f'(f(x)) \cdot f'(x) + 2f(x)f'(x) = \frac{dy}{dx}$

$f'f(f(1)) \cdot f'(f(1)) \cdot f'(1) + 2f(1)f'(1)$ — at $x=1$,

$3 \times 3 \times 3 + 2 \times 1 \times 3$

$= 27 + 6 = 33$

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

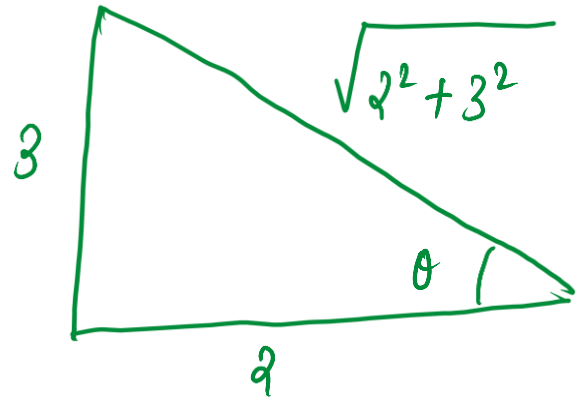
Ans: (d)

SSBCrack EXAMS

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

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

(c) 0 (d) 1



$\frac{2\cos x + 3\sin x}{\sqrt{2^2+3^2}} = \left(\frac{2}{\sqrt{2^2+3^2}}\right)\cos x + \frac{3}{\sqrt{2^2+3^2}}\sin x$

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

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

$\cos(-A) = \cos A$

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

$y = x - \theta$ { As θ is constant.

$\frac{dy}{dx} = 1$

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)

SSBCrack EXAMS

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) $-\log 2$

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

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

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

$\tan\theta = x^{-x}$ (for $x = 1$, $\theta = \frac{\pi}{4}$)

$\log\tan\theta = (-x)\log x$

$f'(x) = 2\left(\frac{d\theta}{dx}\right) = 2x\left(\frac{-1}{2}\right)$

$= -1$ //

$\frac{\sec^2\theta}{\tan\theta} = (-1 - \log x)\frac{dx}{d\theta}$

$\left(-2 = \frac{dx}{d\theta}\right)$

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) $-\log 2$

Ans: (a)

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

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

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

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

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

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

Ans: (c)

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

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

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 $y = \ell n(\operatorname{cosec} x - \cot x)$, 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

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

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

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

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

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) $(-1, \infty)$

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) $(-1, \infty)$

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) $5(1 - t^2)$

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) $5(1 - t^2)$

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

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

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

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

Ans: (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) $\sin(a + b)$

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: (c)

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

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

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

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

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) $(-1, \infty)$

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) $(-1, \infty)$

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) $5(1 - t^2)$

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) $5(1 - t^2)$

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

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

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

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

Ans: (b)

REVISION TOPICS : (22/08/24)

- Differentiability
- AOD
- Integration

NDA 2 2024

LIVE

MATHS REVISION

CLASS 12

NAVJYOTI SIR

SSBCrack EXAMS