Ultimate KCET Crash Course 2026

MATHS

DPP: 1

Methods of Differentiation

Q1 $y = \log_e [\log_e \cos x]$ then $\frac{dy}{dx}$ is

(A) $\frac{1}{\log_e \cos x}$

(B) $\frac{-\sin x}{\log_e \cos x}$

(C) $\frac{\log_e \cos x}{\cos x}$

(D) $\frac{-\tan x}{\log_e \cos x}$

Q2 $\frac{d}{dx}\left[\sin^n x \cos nx\right] =$

(A) $n \sin^{n-1} x \cos(n+1)x$

(B) $n \sin^{n-1} x \cos nx$

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

(D) $n \sin^{n-1} x \sin(n+1)x$

Q3 $\frac{d}{dx}\left[\cos\left(1-x^2\right)^2\right] =$

(A) $-2x\left(1-x^2\right)\sin\left(1-x^2\right)^2$

(B) $-4x\left(1-x^2\right)\sin\left(1-x^2\right)^2$

(C) $4x\left(1-x^2\right)\sin\left(1-x^2\right)^2$

(D) $-2\left(1-x^2\right)\sin\left(1-x^2\right)^2$

Q4 $\frac{d}{dx}\left[\left(\log_e x\right)\left(\log_a x\right)\right] =$

(A) $\frac{\log_a x}{x}$ (B) $\frac{\log_x x}{x}$

(C) $\frac{2\log x}{x}$ (D) $\frac{2\log_a x}{x}$

Q5 If $x = \exp\left\{\tan^{-1}\left(\frac{y-x^2}{x^2}\right)\right\}$, then $\frac{dy}{dx}$ equals

(A) 2x[1 + tan (log x)] + x $\sec^2$ (log x)

(B) x[1 + tan (log x)] + $\sec^2$ (log x)

(C) 2x [1 + tan (log x)] + x^2 $\sec^2$ (log x)

(D) 2x [1 + tan (log x)] + $\sec^2$ (log x)

Q6 If $y = a \sin^2 x + b \cos^2 x$ then $\frac{dy}{dx}$ at $x = \frac{\pi}{6}$ is

(A) $\sqrt{2}(a-b)$ (B) 2(b – a)

(C) 0 (D) $(a-b)\frac{\sqrt{3}}{2}$

Q7 If $y = x^2 + \frac{1}{x^2+\frac{1}{x^2+\frac{1}{x^2+\ddots\infty}}}$. Find $\frac{dy}{dx}$.

(A) $\frac{2xy}{1+y}$ (B) $\frac{2xy^2}{1+y}$

(C) $\frac{2xy^2}{1+y^2}$ (D) $\frac{2y^2}{1+y^2}$

Q8 $\frac{d}{dx}\left(\sqrt{\sec^{-1} x^2}\right) =$

(A) $\frac{1}{x\sqrt{\sec^{-1} x^2}\cdot\sqrt{x^4-1}}$

(B) $\frac{x}{\sqrt{\sec^{-1} x^2}\cdot\sqrt{x^4-1}}$

(C) $\frac{-1}{x\sqrt{\sec^{-1} x^2}\cdot\sqrt{x^4-1}}$

(D) $\frac{-1}{\sqrt{\sec^{-1} x^2}\cdot\sqrt{x^4-1}}$

Q9 $\frac{d}{dx}\{\log(\text{cosec } x + \cot x)\} =$

(A) cosec x (B) -cosec x

(C) cosec x. cot x (D) cot x

Q10 If $y = \log\left[e^x\left(\frac{x-1}{x+2}\right)^{1/2}\right]$, then $\frac{dy}{dx}$ is equal to

(A) 7 (B) $\frac{3}{x-2}$

(C) $\frac{3}{(x-1)}$ (D) None of these

Q11 $\frac{d}{dx}\left[\sin^{-1} x^2 + \cos^{-1} e^x\right]$ is

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

(B) $\frac{2x}{\sqrt{1-x^4}} - \frac{e^x}{\sqrt{1-e^{2x}}}$

(C) $\frac{1}{\sqrt{1-x^4}} - \frac{1}{\sqrt{1-e}}$

(D) 0

Q12 If $y\sqrt{x^2+1} = \log\left(\sqrt{x^2+1} - x\right)$, is equal then $\left(x^2+1\right)y' + xy + 1$ to

(A) 0 (B) 1

(C) 2 (D) None of these

Q13 If $\sin^2 mx + \cos^2 ny = a^2$ then $\frac{dy}{dx}$

(A) $\frac{m.\sin 2mx}{n.\sin 2ny}$

(B) $\frac{m.\sin mx}{n.\sin nx}$

(C) $\frac{-m.\cos 2mx}{n.\cos 2nx}$

(D) $\frac{n.\sin 2mx}{m.\sin 2nx}$

Q14 If $y = x \sin y$, then dy/dx=

(A) $\frac{\sin y}{1-x\cos y}$

(B) $\frac{\cos y}{1+x\sin y}$

(C) cos y - x sin y

(D) None of these

Q15 If $y = \sin(2\sin^{-1}x)$ then $\frac{dy}{dx} =$

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

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

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

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

Q16 If $x + y = \sin(x+y)$ then $\frac{dy}{dx} =$

(A) $\frac{1}{2}$ (B) 0

(C) –1 (D) $\frac{1}{3}$

Q17 If $y = x - \tan^{-1}y$ then dy/dx=

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

(C) $1 - \frac{1}{2+y^2}$ (D) 0

Q18 If $xe^{xy} = y + \sin^2 x$, then at $x = 0$, dy/dx is equal to

(A) 1 (B) -1

(C) 2 (D) 0

Q19 If $ax^2 + 2hxy + by^2 = 0$ then $\frac{dy}{dx} =$

(A) $-\left(\frac{ax+hy}{hx+by}\right)$

(B) $\left(\frac{ax+hy}{hx+by}\right)$

(C) –(ax+hy) (hx+by)

(D) (ax+hy) (hx+by)

Q20 If $3x^2 + 2xy + y^2 = 6$, then dy/dx at (1, 1) is

(A) -2 (B) 2

(C) 0 (D) None of these

Q21 If $\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n = 2$ then $\frac{dy}{dx}$ at (a, b) is

(A) a/b (B) –a/b

(C) b/a (D) –b/a

Q22 If $3^x + 3^y = 3^{x+y}$, then dy/dx=

(A) $\frac{3^x+3^y}{3^x-3^y}$

(B) $\frac{3^x-3^y}{3^x+3^y}$

(C) $3^{x-y}\left(\frac{3^y-1}{1-3^x}\right)$

(D) $\frac{3^x+3^y+y}{1+3^x+y}$

Q23 If $5x^2 + 3xy + y^2 = 9$, then dy/dx at (1, 1) is

(A) -2 (B) 0

(C) -13/5 (D) None of these

Q24 If y is a function of x and $\log(x + y) - 2xy = 0$, then the value of $y'(0)$ is

(A) 1 (B) -1

(C) 2 (D) 0

Q25 If $3x^2 + 4xy + 2y^2 + x - 8 = 0$ then $\left(\frac{dy}{dx}\right)_{(-1,3)} =$

(A) $\frac{3}{8}$ (B) $\frac{-7}{8}$

(C) $\frac{5}{8}$ (D) $\frac{-5}{8}$

Q26 If $xe^{xy} = y + \sin^2 x$, then at $x = 0$, dy/dx is equal to

(A) 1 (B) -1

(C) 2 (D) 0

Q27 If $3\sin(xy) + 4\cos(xy) = 5$, then dy/dx=

(A) $\frac{3\sin(xy)+4\cos(xy)}{3\cos(xy)-4\sin(xy)}$

(B) $\frac{y}{x}$

(C) $-\frac{y}{x}$

(D) None of these

Q28 If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ then $\frac{dy}{dx} =$

(A) $\frac{-(ax+hy+g)}{(hx+by+f)}$

(B) $\frac{-(hx+by+f)}{(ax+hy+g)}$

(C) $\frac{(ax+hy+g)}{(hx+by+f)}$

(D) $\frac{(hx+by+f)}{(ax+hy+g)}$

Q29 $f'(x) = \cos(\log_e x)$ and y is $= f\left(\frac{x+1}{x-1}\right)$ then $\frac{dy}{dx}$

(A) $\cos\left[\log_e\left(\frac{x+1}{x-1}\right)\right]$

(B) $\cos\left[\log_e\left(\frac{x+1}{x-1}\right)\right] \times \frac{2}{(x-1)^2}$

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

(D) $-\cos\left[\log_e\left(\frac{x+1}{x-1}\right)\right] \times \frac{2}{(x-1)^2}$

Q30 $\frac{d}{dx}\{\log_a(x^2+1)\} =$

(A) $\frac{\log_a e.2x}{(x^2+1)}$ (B) $\frac{\log_e a.2x}{(x^2+1)}$

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

Answer Key

Q1	D
Q2	A
Q3	C
Q4	D
Q5	A
Q6	D
Q7	C
Q8	A
Q9	B
Q10	D
Q11	B
Q12	A
Q13	A
Q14	A
Q15	C
Q16	C
Q17	C
Q18	A
Q19	A
Q20	A
Q21	D
Q22	C
Q23	C
Q24	A
Q25	B
Q26	A
Q27	C
Q28	A
Q29	D
Q30	A

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

$$\frac{dy}{dx} = \frac{-\tan x}{\log_e(\cos x)}$$

Video Solution:

Q2 Text Solution:

$$\frac{d}{dx}(\sin^n x \cos nx)$$

$$= \sin^n x[-n \sin nx]$$

$$+ \cos nx\left[n \sin^{n-1} x\right]\cos x$$

$$= n \sin^{n-1} x[-\sin x.\sin nx + \cos nx.\cos x]$$

$$= n \sin^{n-1} x \cos(n+1)x$$

Video Solution:

Q3 Text Solution:

$$\frac{d}{dx}\left(\cos\left(1-x^2\right)^2\right) =$$

$$-\sin\left(1-x^2\right)^2 \frac{d}{dx}\left[\left(i-x^2\right)\right]$$

$$= \sin\left(1-x^2\right)^2 2\left(1-x^2\right)(-2x)$$

$$= 4x\left(1-x^2\right)\sin\left(1-x^2\right)^2$$

Video Solution:

Q4 Text Solution:

$$\frac{d}{dx}\left\{\frac{\log x}{\log e}.\frac{\log x}{\log a}\right\} = \frac{1}{\log a}\frac{d}{dx}\left\{(\log x)^2\right\}$$

$$= \frac{1}{\log a} 2 \log x \frac{1}{x} = \frac{2\log_a x}{x}$$

Video Solution:

Q5 Text Solution:

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

$$\Rightarrow \tan(\log x) = \frac{y-x^2}{x^2} \Rightarrow x^2 \tan(\log x) + x^2 = y$$

$$\therefore y = x^2(1+\tan(\log x))$$

$$\frac{dy}{dx} = 2x\{1+\tan(\log x)\} + x\sec^2(\log x)$$

Video Solution:

Q6 Text Solution:

$\frac{dy}{dx} = \left(a - b\right) \sin 2x$

$when\ x = \frac{\pi}{6}$

$\frac{dy}{dx} = \left(a - b\right) \frac{\sqrt{3}}{2}$

Video Solution:

Q7 Text Solution:

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

$y - \frac{1}{y} = x^2$

diff. w.r.t. x

$y_1 - \left(-\frac{1}{y_2}\right) y_1 = 2x$

$y_1 + \frac{y_1}{y_2} = 2x$

$y_1 \left[1 + \frac{1}{y^2}\right] = 2x$

$y_1 = \frac{2xy^2}{1+y^2}$

Video Solution:

Q8 Text Solution:

$\frac{d}{dx}\left(\sqrt{\sec^{-1} x^2}\right) = \frac{1}{2\sqrt{\sec^{-1} x^2}} \frac{d}{dx}\left(\sec^{-1} x^2\right)$

$= \frac{1}{x\sqrt{\sec^{-1} x^2} \cdot \sqrt{x^4 - 1}}$

Video Solution:

Q9 Text Solution:

$\frac{d}{dx}\{\log(\text{cosec } x + \cot x)\}$

$= \frac{1}{\text{cosec } x + \cot x}\left(-\cos ecx.\, cotx - \cos ec^2 x\right)$

$= -\cos ecx$

Video Solution:

Q10 Text Solution:

On simplifying

$y = x + \frac{1}{2}\{\log(x - 1) - \log x + 2\}$

$\frac{dy}{dx} = 1 + \frac{3}{(x-1)(x+2)}$

Video Solution:

Q11 **Text Solution:**

$$\frac{d}{dx}\left[\sin^{-1} x^2 + \cos^{-1} e^x\right] = \frac{2x}{\sqrt{1-x^4}} - \frac{e^x}{\sqrt{1-e^{2x}}}$$

Video Solution:

Q12 **Text Solution:**

$$\frac{dy}{dx}\sqrt{x^2+1} + y \times \frac{1}{2\sqrt{x^2+1}} \times 2x = \frac{1}{\sqrt{x^2+1}-x} \times \left[\frac{2x}{2\sqrt{x^2+1}} - 1\right]$$

$$\Rightarrow (x^2+1)\frac{dy}{dx} + xy = \sqrt{x^2+1} \times \frac{-1}{\sqrt{x^2+1}}$$

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

Video Solution:

Q13 **Text Solution:**

$$\frac{dy}{dx} = \frac{m.\sin 2mx}{n.\sin 2ny}$$

Video Solution:

Q14 **Text Solution:**

$$y = x\sin y \Rightarrow \frac{dy}{dx} = \sin y + x\cos y\frac{dy}{dx}$$

$$\Rightarrow \frac{dy}{dx} = \frac{\sin y}{1 - x\cos y}$$

Video Solution:

Q15 **Text Solution:**

$$\sin^{-1} y = 2\sin^{-1} x$$

Differentiating both sides wrt x.

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

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

Video Solution:

Q16 **Text Solution:**

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

Video Solution:

Q17 **Text Solution:**

$$y = x - \tan^{-1} y \Rightarrow \frac{dy}{dx} = 1 - \frac{1}{1+y^2}\frac{dy}{dx}$$

$$\Rightarrow \left(1 + \frac{1}{1+y^2}\right)\frac{dy}{dx} = 1$$

$$\Rightarrow \frac{dy}{dx} = \frac{1}{1+\frac{1}{1+y^2}} = \frac{1}{\frac{1+y^2+1}{1+y^2}} = \frac{1+y^2}{2+y^2} = \frac{2+y^2-1}{2+y^2}$$

$$= 1 - \frac{1}{2+y^2}$$

Video Solution:

Q18 **Text Solution:**

$$e^{xy} + xe^{xy}\left[xy' + y\right] = y' + 2\sin x \cos x$$

Putting x = 0, y = 0

$$e^0 + 0 \cdot e^0\left[0 \times \frac{dy}{dx} + 0\right] = \frac{dy}{dx}\Big|_{x=0} + 0$$

$$\therefore \frac{dy}{dx}\Big|_{x=0} = 1$$

Video Solution:

Q19 **Text Solution:**

$$\frac{dy}{dx} = -\left(\frac{ax+hy}{hx+by}\right)$$

Video Solution:

Q20 **Text Solution:**

$$3x^2 + 2xy + y^2 = 6 \Rightarrow 3 \cdot 2x + 2x\frac{dy}{dx} + 2y + 2y\frac{dy}{dx} = 0$$

$$\Rightarrow (6x + 2y) + (2x + 2y)\frac{dy}{dx} = 0 \Rightarrow \frac{dy}{dx} = -\frac{(3x+y)}{x+y}$$

$$\text{at } (1,\ 1)\ \frac{dy}{dx} = \frac{(3+1)}{1+1} = -2$$

Video Solution:

Q21 **Text Solution:**

$$\frac{dy}{dx} = \frac{\frac{-1}{a}\left(\frac{x}{a}\right)^{n-1}}{\frac{-1}{b}\left(\frac{y}{b}\right)^{n-1}}$$

$$\Rightarrow at\left(a, b\right)$$

$$\frac{dy}{dx} = -\frac{b}{a}$$

Video Solution:

Q22 **Text Solution:**

$$3^x + 3^y = 3^{x+y} \Rightarrow 3^x \cdot \log 3 + 3^y \log 3\frac{dy}{dx}$$

$$= 3^{x+y}\log 3\left(1 + \frac{dy}{dx}\right)$$

$$\Rightarrow \left(3^y - 3^{x+y}\right)\frac{dy}{dx} = 3^{x+y} - 3^x$$

$$\Rightarrow \frac{dy}{dx} = \frac{3^{x+y}-3^x}{3^y-3^{x+y}} = \frac{3^x(3^y-1)}{3^y(1-3^x)} = 3^{x-y}\frac{(3^y-1)}{(1-3^x)}$$

Video Solution:

Q23 **Text Solution:**

$5x^2 + 3xy + y^2 = 10 \Rightarrow 10x + 3x\frac{dy}{dx} + 3y + 2y\frac{dy}{dx} = 0$

$\Rightarrow (10x + 3y) + (3x + 2y)\frac{dy}{dx} = 0$

$\Rightarrow \frac{dy}{dx} = -\frac{(10x+3y)}{3x+2y} \Rightarrow \text{at } (1,\ 1)\frac{dy}{dx} = -\frac{(10+3)}{3+2} = -\frac{13}{5}$

Video Solution:

Q24 **Text Solution:**

As per data if x = 0, then y = 1

Differentiating w.r.t. x,

$\Rightarrow \frac{1}{x+y}\left[1 + y'\right] = y + 2xy'$

$\Rightarrow y' = \frac{\frac{1}{x+y} - 2y}{2x - \frac{1}{x+y}} \Rightarrow y'(0) = 1$

Video Solution:

Q25 **Text Solution:**

$\frac{dy}{dx} = \frac{-(1+6x+4y)}{4(x+y)}$

$\text{at } \left(-1, 3\right)$

$\frac{dy}{dx} = -\frac{7}{8}$

Video Solution:

Q26 **Text Solution:**

$e^{xy} + xe^{xy}\left[xy' + y\right] = y' + 2\sin x \cos x$

Putting x = 0, y = 0

$e^0 + 0 \cdot e^0\left[0 \times \frac{dy}{dx} + 0\right] = \left.\frac{dy}{dx}\right|_{x=0} + 0$

$\therefore \left.\frac{dy}{dx}\right|_{x=0} = 1$

Video Solution:

Q27 **Text Solution:**

$\frac{3}{5}\sin(xy) + \frac{4}{5}\cos xy = 1$

$\Rightarrow \sin(xy + \alpha) = 1 \text{ where } \alpha = \tan^{-1}\frac{4}{3}$

$\Rightarrow xy + \alpha = \frac{\pi}{2}$

Differentiating w.r.t. 'x' we get

$x\frac{dy}{dx} + y \cdot 1 = 0 \Rightarrow \frac{dy}{dx} = \frac{-y}{x}$

Video Solution:

Q28 **Text Solution:**

$\frac{dy}{dx} = \frac{-(ax+hy+g)}{(hx+by+f)}$

Video Solution:

Q29 **Text Solution:**

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

$= \cos\left[\log_e\left(\frac{x+1}{x-1}\right)\right] \times \frac{(x-1)(1)-(x+1)(1)}{(x-1)^2}$

$= \cos\left[\log_e\left(\frac{x+1}{x-1}\right)\right] \times \frac{-2}{(x-1)^2}$

Video Solution:

Q30 **Text Solution:**

The required differentiation is $\frac{\log_a e.2x}{\left(x^2+1\right)}$

Video Solution: