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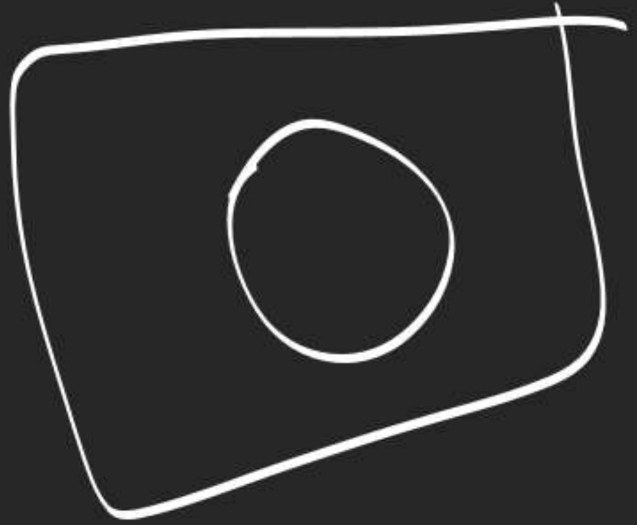
3. (iv) $\cancel{\cos 24^\circ} + \cancel{\cos 55^\circ} + \cancel{\cos 125^\circ} + \cancel{\cos 204^\circ} + \cos 300^\circ$

$125^\circ = 180^\circ - 55^\circ$

$204^\circ = 180^\circ + 24^\circ$

$300 = 360 - 60$



$\sin \cancel{120^\circ} + \cos \cancel{150^\circ} - \cancel{\tan 180^\circ}$

$\frac{\sqrt{3}}{2} \quad -\frac{\sqrt{3}}{2} \quad = 0$

$= \cos 60^\circ$

$= \frac{1}{2}$

(vi) $\sin(1560 - \underline{1440}) + \cos(-3030 + 2880) + \tan(-1260 + 1080)$

4. $2\sin^2 x + 2\sin x + \sin x + 1 = 0$

$(2\sin x + 1)(\sin x + 1) = 0$

$\sin x = -\frac{1}{2}, -1$

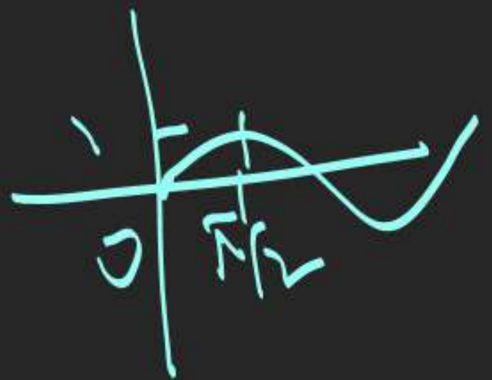
$\frac{7\pi}{6}, \frac{11\pi}{6}, \frac{3\pi}{2}$

$180+30$

$360-30^\circ$

$\alpha \in (0, \pi/2)$

$\sin\alpha = \frac{1}{3}$



α $\frac{1}{3}$

$\sin\beta = \frac{1}{4}$ $\beta \in (0, \frac{\pi}{2})$

$\pi+\alpha, 2\pi-\alpha \rightarrow 3\pi$

$\pi+\beta, 2\pi-\beta$

$\sin x = -\frac{1}{3}$

$1+t^2 > 1$ >1

$1-t^2$

$\boxed{6\pi}$ $\left|\frac{1+t^2}{1-t^2}\right| > 1$

Find sum of all values of x in $[0, 2\pi]$ satisfying

$(3\sin x + 1)(4\sin x + 1) = 0$

Q10 → leave

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1.
$$\frac{\sin A(\cos(B+C)) + \cos A\sin(B+C)}{\cos A\cos B\cos C}$$

$$= \frac{\sin A\cos B\cos C - \sin A\sin B\sin C + \cos A\sin B\cos C + \cos A\sin C\cos B}{\cos A\cos B\cos C}$$

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$$\sin(A+B) = \frac{3}{5}\times\left(-\frac{12}{13}\right) + \frac{5}{13}\left(-\frac{4}{5}\right)$$

8. $$\cot(A-B) = \frac{1+\tan A\tan B}{\tan A - \tan B} = \frac{1+\left(-\frac{x}{y}\right)}{x}$$

$$\frac{1}{\tan A} - \frac{1}{\tan B} = y$$

$$\frac{-x}{\tan A\tan B} = y$$

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$$\frac{1}{\frac{\sec\frac{\pi}{12}}{\tan\frac{\pi}{12}}} - \frac{1}{\frac{\operatorname{cosec}\frac{\pi}{12}}{\cot\frac{\pi}{12}}}$$

$$\frac{1}{\sin\frac{\pi}{12}} - \frac{1}{\cos\frac{\pi}{12}} = \frac{2\left(\cos\frac{\pi}{12} - \sin\frac{\pi}{12}\right)}{2\sin\frac{\pi}{12}\cos\frac{\pi}{12}}$$

$$= \frac{2\left(\frac{\sqrt{3}+1}{2\sqrt{2}} - \frac{\sqrt{3}-1}{2\sqrt{2}}\right)}{\frac{1}{2}}$$

10.

$90-22$

$$\frac{\cancel{\cos 68^\circ}\cos 22^\circ}{\sin 56^\circ \sin 34^\circ \cancel{\sin 22^\circ}}$$

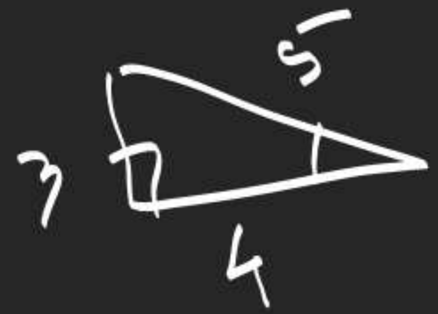
$\cos 34 \leftarrow 90-34$

$$= \frac{\cos 22^\circ}{\sin 34^\circ \cos 34^\circ} \quad \frac{1}{2} \quad = \frac{2\cancel{\cos 22^\circ}}{\cancel{\sin 68^\circ}} = 2$$

12.

$$\tan\frac{x}{2} = \frac{1-\cos x}{\sin x} = \frac{1-\left(-\frac{4}{5}\right)}{-\frac{3}{5}} = -3.$$

$\tan x =$



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$a \sin x + b \cos x$

$$f(x) = \sin x + \sqrt{3} \cos x = 2\left(\underbrace{\frac{1}{2}}_{\cos\frac{\pi}{3}} \sin x + \underbrace{\frac{\sqrt{3}}{2}}_{\sin\frac{\pi}{3}} \cos x\right) = 2 \sin\left(x + \frac{\pi}{3}\right)$$

find range

$$R_f = [-2, 2]$$

$$D_f = R$$

Nishant Jindal

1. Find the domain and range of

(i) $f(x) = \dfrac{3\sin x - 4\cos x + 15}{10}$

$$\boxed{\begin{aligned} R_f &= [1, 2] \\ D_f &= R \end{aligned}}$$

$-5 \le 3\sin x - 4\cos x \le 5$

$10 = 15 - 5 \le 3\sin x - 4\cos x + 15 \le 15 + 5 = 20$

(ii) $f(x) = \sin^2\left(\frac{15\pi}{8} - 4x\right) - \sin^2\left(\frac{17\pi}{8} - 4x\right)$

$- \sin\frac{\pi}{4} \sin(-8x) = \sin\left(-\frac{2\pi}{8}\right) \sin\left(\frac{32\pi}{8} - 8x\right)$

4π

$= \frac{1}{\sqrt{2}} \sin 8x$

$D_f = R$

$R_f = \left[-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right]$

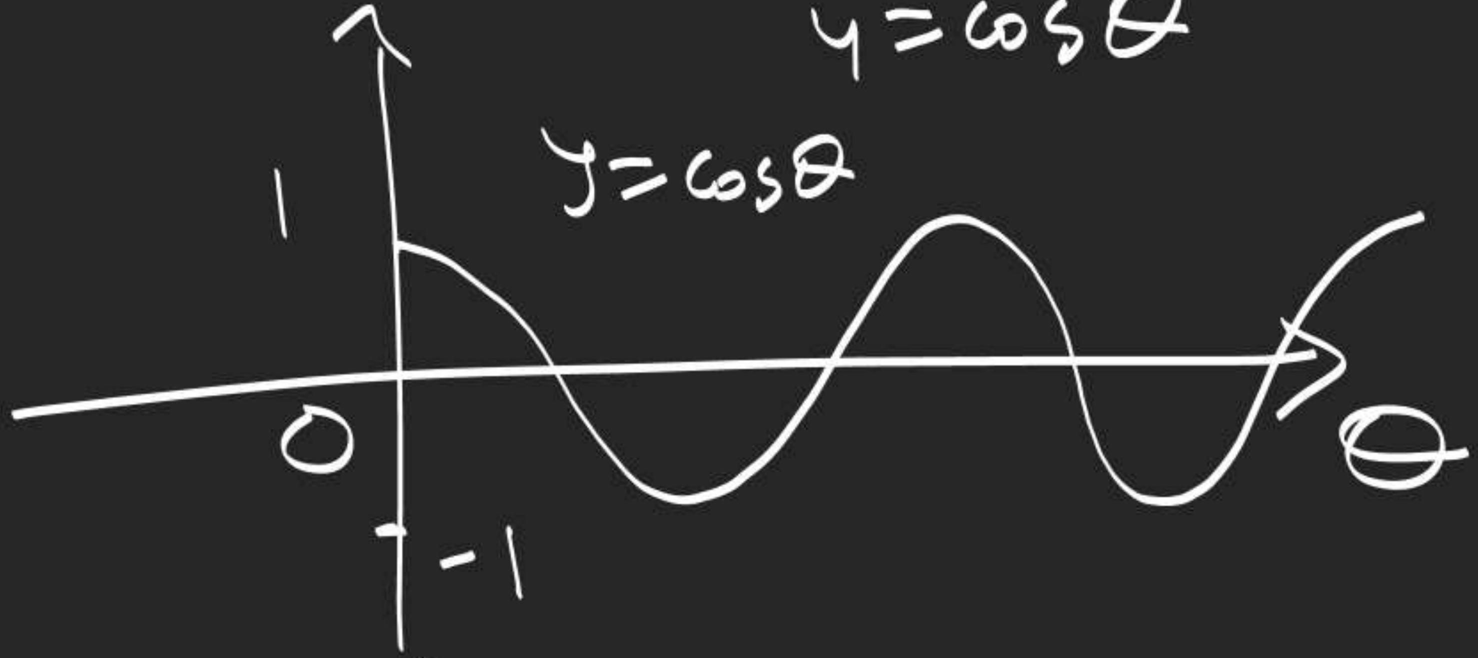
Nishant Jindal

1. $f(x) = \cos(x^2)$, find Domain & Range

$y = \cos\theta$

$D_f = R$

$R_f = [-1, 1]$



$x^2 \in [0, \infty)$ ✓

$\theta = x^2$

Nishant Jindal

$f(x) = \tan(x^2)$, find range & domain

$\theta = x^2 \geq 0$

$y = \tan\theta$

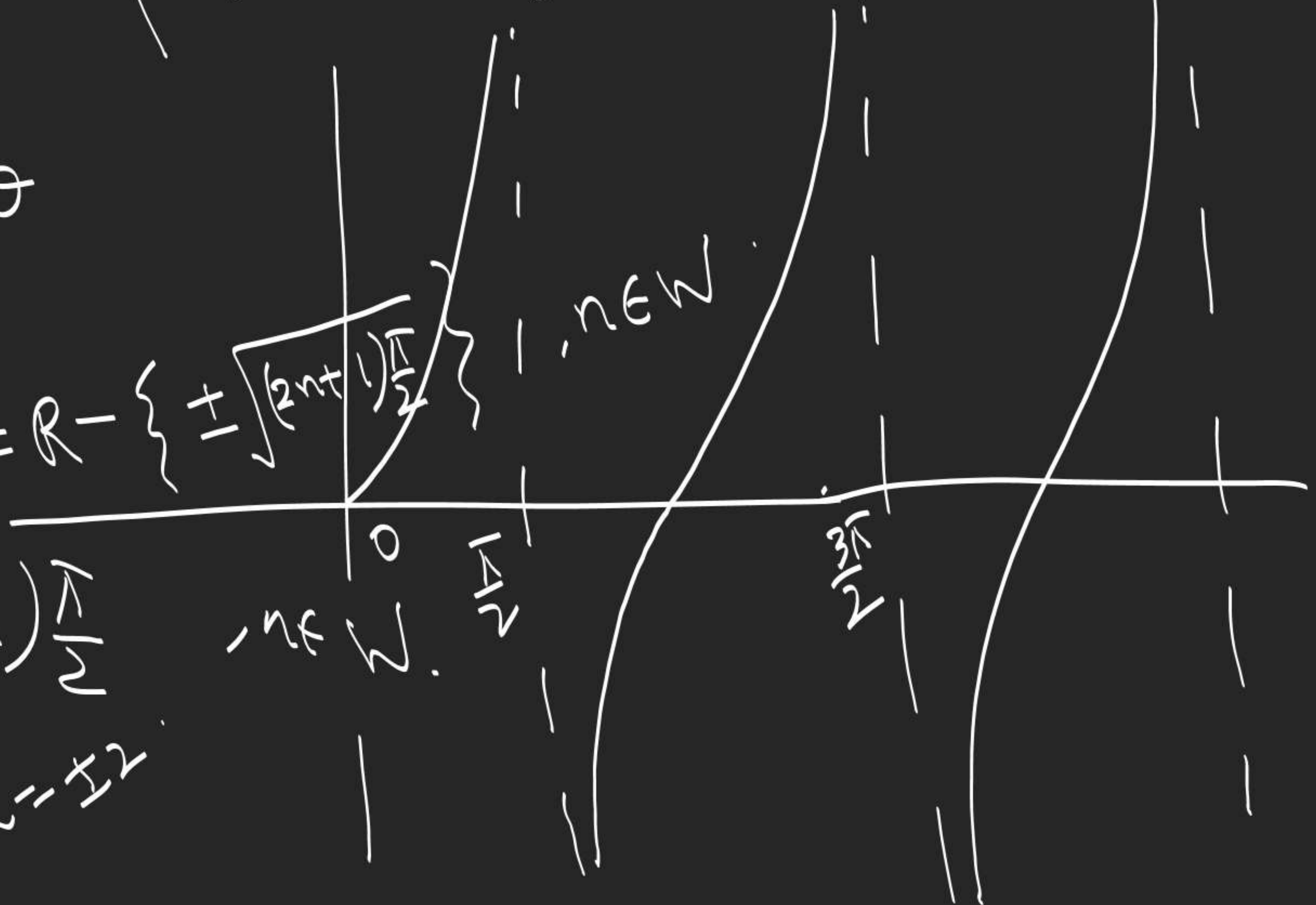
$R_f = R$

$D_f = R - \left\{ \pm\sqrt{(2n+1)\frac{\pi}{2}} \right\}, n \in W$

$x^2 = (2n+1)\frac{\pi}{2}$, $n \in W$.

$x^2 = 4$

$x = \pm 2$



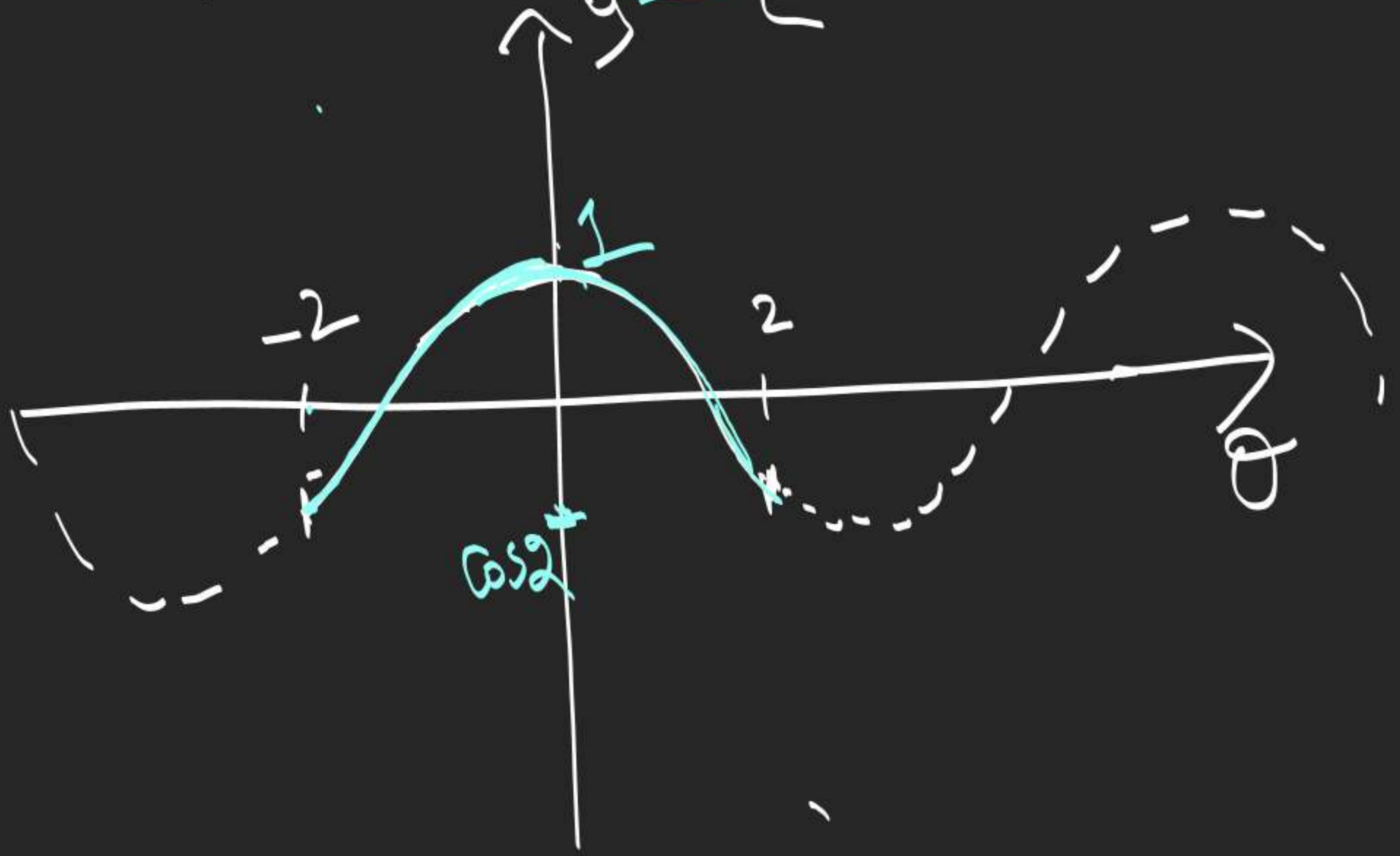
Nishant Jindal

2: Find domain & range of

$$f(x) = \cos(2\sin x)$$

$$f(\theta) = \cos\theta \qquad \theta \in [-2, 2]$$

$$D_f = R$$



$$R_f = [\cos 2, 1] \checkmark$$

Nishant Jindal

Find domain & range of

1. $f(x) = 3\cos\left(x+\frac{\pi}{3}\right) + 5\cos x + 3$

$\boxed{D_f = R}$ $\boxed{[-4, 10]}$ $= 3\left(\frac{1}{2}\cos x - \frac{\sqrt{3}}{2}\sin x\right) + 5\cos x + 3$

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

$R_f = [3-7, 3+7]$

$-7 = -\sqrt{\frac{169}{4}+\frac{27}{4}} \le \frac{13}{2}\cos x - \frac{3\sqrt{2}}{2}\sin x \le \sqrt{\frac{169}{4}+\frac{27}{4}} = 7$

Nishant Jindal

2.

$$f(x) = \sin\left(x + \frac{\pi}{3}\right) + 3\cos\left(x - \frac{\pi}{3}\right)$$

$$= \frac{1}{2}\sin x + \frac{\sqrt{3}}{2}\cos x + 3\left(\frac{1}{2}\cos x + \frac{\sqrt{3}}{2}\sin x\right)$$

$$= \left(\frac{3+\sqrt{3}}{2}\right)\cos x + \left(\frac{3\sqrt{3}+1}{2}\right)\sin x$$

$$9 + 3 + 6\sqrt{3} + 27 + 1 + 6\sqrt{3}$$

$$\frac{40 + 12\sqrt{3}}{4}$$

$$\in \left[-\sqrt{\frac{(3+\sqrt{3})^2}{4} + \frac{(3\sqrt{3}+1)^2}{4}}, \sqrt{}\right]$$

$$R_f = \left[-\sqrt{10 + 3\sqrt{3}}, \sqrt{10 + 3\sqrt{3}}\right]$$

Nishant Jindal

3. $f(x) = \cos^2 x - 4\cos x + 13$

$\cos^2 x - 2(2)\cos x + 4 = (\cos x - 2)^2 + 9$

$\boxed{R_f = [10, 18]}$

$-1 \le \cos x \le 1$

$-3 \le \cos x - 2 \le -1$

$\Rightarrow 1 \le (\cos x - 2)^2 \le 9$

$1+9 \le (\cos x - 2)^2 + 9 \le 9+9$

4. $f(x) = \cos 2x + 3\sin x$

$-1 < x < 2 \Rightarrow 0 \le x^2 < 4$

$-3 < x < -1$

$1 < x^2 < 9$

$1 < x < 3$

$\Rightarrow 1 < x^2 < 9$

$-3 < x < 2$

$x^2 \in [0, 9)$

Nishant Jindal

$D_f = R$

$$f(x) = \cos 2x + 3\sin x$$
$$= 1 - 2\sin^2 x + 3\sin x$$
$$= 1 - 2\left(\sin^2 x - \frac{3}{2}\sin x\right)$$
$$= 1 - 2\left(\left(\sin x - \frac{3}{4}\right)^2 - \frac{9}{16}\right) = \frac{17}{8} - 2\left(\sin x - \frac{3}{4}\right)^2$$

$$-\frac{7}{4} = -1 - \frac{3}{4} \le \sin x - \frac{3}{4} \le 1 - \frac{3}{4} = \frac{1}{4}$$

$$0 \le \left(\sin x - \frac{3}{4}\right)^2 \le \frac{49}{16}$$

$$-\frac{49}{8} \le -2\left(\sin x - \frac{3}{4}\right)^2 \le 0$$

$$R_f = \left[\frac{17}{8} - \frac{49}{8}, \frac{17}{8} + 0\right] = \left[-4, \frac{17}{8}\right]$$

Ex-I (Complete)