$\Rightarrow \cos\theta = \frac{-P}{2P} = \frac{-1}{2} \Rightarrow \theta = 120^\circ = \frac{2\pi}{3}$

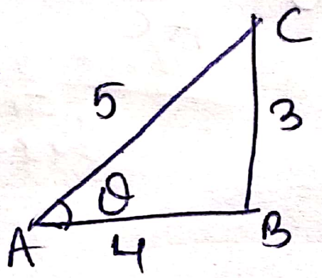
$\Rightarrow \frac{2\pi}{n} = \frac{2\pi}{3}$

$\Rightarrow n = 3$

WS-1 Task 9th foundation.

① Given $\sin\theta = \frac{6}{10} \Rightarrow \sin\theta = \frac{3}{5}$.

From the triangle




$\tan\theta = \frac{BC}{AB} = \frac{3}{4}$

$\sec\theta = \frac{AC}{AB} = \frac{5}{4}$

$\tan\theta + \sec\theta = \frac{3}{4} + \frac{5}{4}$

$= \frac{8}{4}$

$= 2$

From Pythagorous theorem

$AC^2 = AB^2 + BC^2$

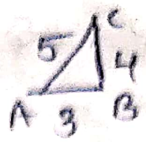
$\Rightarrow 5^2 = AB^2 + 3^2$

$\Rightarrow 25 = AB^2 + 9$

$\Rightarrow AB^2 = 25 - 9$

$\Rightarrow AB^2 = 16 \Rightarrow AB = 4$

② Given $4\cot A = 3 \Rightarrow \cot A = \frac{3}{4}$

$\therefore \sin A = \frac{BC}{AC} = \frac{4}{5}$ From 


$\cos A = \frac{AB}{AC} = \frac{3}{5}$

From Pythagorous theorem

$AC^2 = AB^2 + BC^2$

$= 3^2 + 4^2$

$= 9 + 16$

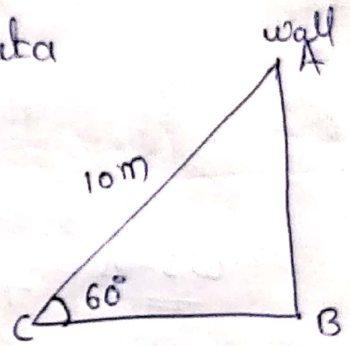
$AC^2 = 25 \Rightarrow AC = 5$

$\therefore \frac{\sin A + \cos A}{\sin A - \cos A} = \frac{\frac{4}{5} + \frac{3}{5}}{\frac{4}{5} - \frac{3}{5}}$

$= \frac{\frac{4+3}{\cancel{5}}}{\frac{4-3}{\cancel{5}}}$

$= \frac{7}{1} = 7$

③ According to given data




$AC \to$ pole $= 10m$

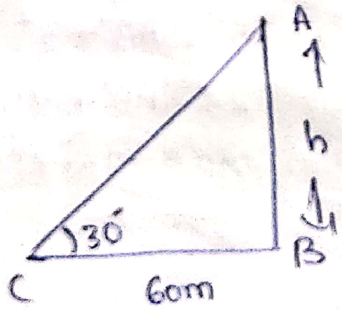
$BC \to$ Ground

How far is the foot of the pole from wall means $BC = ?$

$\therefore$ From $\cos\theta = \frac{BC}{AC} \Rightarrow \cos 60° = \frac{BC}{10}$

$\Rightarrow \frac{1}{\cancel{2}} = \frac{BC}{\cancel{10}\,5} \Rightarrow BC = 5m$

④




$AB \to$ Tower of height h.

From $\tan\theta = \frac{AB}{BC}$

$\Rightarrow \tan 30° = \frac{h}{60}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{60}$

$\Rightarrow h = \frac{60}{\sqrt{3}} = \frac{20 \times 3}{\sqrt{3}} = 20\sqrt{3}\ m$

(5) They are asking the value of

$\cos 0^\circ + \sin 90^\circ + \sqrt{2}\sin 45^\circ = ?$

$\Rightarrow 1 + 1 + \sqrt{2} \times \frac{1}{\sqrt{2}}$

$\Rightarrow 1 + 1 + 1$

$\Rightarrow 3$

(6) They are asking $\tan 30^\circ \cot 30^\circ + \tan 60^\circ \sec 30^\circ = ?$

$\Rightarrow \frac{1}{\sqrt{3}} \times \sqrt{3} + \sqrt{3} \times \frac{2}{\sqrt{3}}$

$\Rightarrow 1 + 2$

$= 3$

(7) They Given

$$\frac{\sin 45^\circ \times \cos 45^\circ + \tan 30^\circ \times \sec 30^\circ}{\sin 60^\circ - \cos 60^\circ} = ?$$

$$\Rightarrow \frac{\frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} \times \frac{2}{\sqrt{3}}}{\frac{\sqrt{3}}{2} - \frac{1}{2}} = \frac{\frac{1}{2} + \frac{2}{3}}{\frac{\sqrt{3}-1}{2}}$$

$$= \frac{\frac{3+4}{\cancel{2} \times 3}}{\frac{\sqrt{3}-1}{\cancel{2}}} = \frac{7}{3(\sqrt{3}-1)}$$

(8) Given $y = 2x^2$ and also given $\tan\theta = \frac{dy}{dx} = 4x$

At $x = 6$

slope $= \tan\theta = 4x = 4(6) = 24$

(9) Given Area $A = L^2$

we know $\frac{d}{dx} x^n = nx^{n-1}$

$\therefore \lim_{\Delta L \to 0} \frac{\Delta A}{\Delta L} = \frac{dA}{dL} = \frac{d}{dL} L^2 = 2(L^{2-1})$

$= 2L$

(10) In the question they are asking

$$\frac{d}{dx}[\sin x + \log x] = ?$$

$$\left[\begin{array}{l} \frac{d}{dx}\sin x = \cos x \\ \frac{d}{dx}\log x = \frac{1}{x} \end{array}\right]$$

$$\Rightarrow \frac{d}{dx}\sin x + \frac{d}{dx}\log x$$

$$\Rightarrow \cos x + \frac{1}{x}.$$

(11) In the question we have to find out

$$\frac{d}{dx}\left[\frac{3x+4}{4x+5}\right] = ?$$

we know that

$$\frac{d}{dx}\left[\frac{u}{v}\right] = \frac{v\,du - u\,dv}{v^2}$$

In this $v = 4x+5$

$u = 3x+4$

$$\therefore \frac{d}{dx}\left[\frac{3x+4}{4x+5}\right] = \frac{(4x+5)\frac{d}{dx}(3x+4) - (3x+4)\frac{d}{dx}(4x+5)}{(4x+5)^2}$$

$$\boxed{\begin{array}{l} \frac{d}{dx}(3x+4) = 3\frac{dx}{dx} + \frac{d}{dx}(4) \\ = 3(1)+0 = 3 \\ \text{lly} \\ \frac{d}{dx}(4x+5) = 4\frac{dx}{dx} + \frac{d}{dx}(5) \\ = 4(1)+0 = 4 \end{array}}$$

$$= \frac{(4x+5)3 - (3x+4)4}{(4x+5)^2}$$

$$\Rightarrow \frac{\cancel{12x}+15-\cancel{12x}-16}{(4x+5)^2} = \frac{-1}{(4x+5)^2}$$

(12) In the given question, we have to find out

$$\frac{d}{dx}\left[\frac{a-b\cos x}{a+b\cos x}\right]$$

we know that

$$\frac{d}{dx}\left[\frac{u}{v}\right] = \frac{v\frac{d}{dx}u - u\frac{d}{dx}v}{v^2}$$

$$\frac{d}{dx}(a-b\cos x) = \frac{d}{dx}(a) - b\frac{d}{dx}\cos x = 0 - b(-\sin x) = b\sin x$$

lly $\frac{d}{dx}[a+b\cos x] = \frac{d}{dx}(a) + b\frac{d}{dx}\cos x = 0 + b(-\sin x) = -b\sin x$

continue...

$$\therefore \frac{d}{dx}\left[\frac{a-b\cos x}{a+b\cos x}\right] = \frac{(a+b\cos x)\frac{d}{dx}(a-b\cos x) - (a-b\cos x)\frac{d}{dx}(a+b\cos x)}{(a+b\cos x)^2}$$

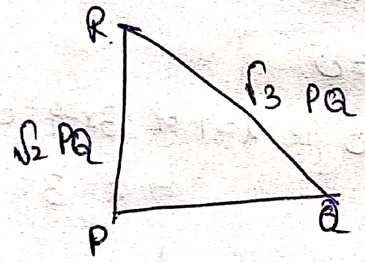
$$= \frac{(a+b\cos x)(b\sin x) - (a-b\cos x)(-b\sin x)}{(a+b\cos x)^2}$$

$$= \frac{ab\sin x + \cancel{b^2\cos x\sin x} + ab\sin x - \cancel{b^2\cos x\sin x}}{(a+b\cos x)^2}$$

$$= \frac{2ab\sin x}{(a+b\cos x)^2}$$

$\left[\because \frac{d}{d\theta}\sin\theta = \cos\theta \quad \frac{d}{d\theta}\cos\theta = -\sin\theta\right]$

(14) Acc to given question.




Acc to Pythagorous theorem

$$QR^2 = PQ^2 + PR^2$$
$$\Rightarrow (\sqrt{3}\,PQ)^2 = PQ^2 + PR^2$$
$$\Rightarrow 3PQ^2 = PQ^2 + PR^2 \Rightarrow PR^2 = 2PQ^2$$
$$\Rightarrow PR = \sqrt{2}\,PQ$$

$\therefore \sin Q = \frac{PR}{RQ}$ $\quad \cos Q = \frac{PQ}{QR}$ $\quad \tan R = \frac{PQ}{RP}$

$\Rightarrow \sin Q = \frac{\sqrt{2}\,PQ}{\sqrt{3}\,PQ}$ $\quad \Rightarrow \cos Q = \frac{PQ}{\sqrt{3}\,PQ}$ $\quad \Rightarrow \tan R = \frac{PQ}{\sqrt{2}\,PQ} = \frac{1}{\sqrt{2}}$

$\Rightarrow \sin Q = \sqrt{\frac{2}{3}}$ $\quad \Rightarrow \cos Q = \frac{1}{\sqrt{3}}$ $\quad \Rightarrow \cot R = \sqrt{2}$

(16) Given $x = a(\theta + \sin\theta)$ & $y = a(1-\cos\theta)$

$\therefore \frac{dx}{d\theta} = a\frac{d}{d\theta}[\theta + \sin\theta]$ ; $\frac{dy}{d\theta} = a\frac{d}{d\theta}(1-\cos\theta)$

$= a\left[\frac{d}{d\theta}\theta + \frac{d}{d\theta}\sin\theta\right]$ $\qquad = a\left[\frac{d}{d\theta}(1) - \frac{d}{d\theta}\cos\theta\right]$

$\Rightarrow a[1+\cos\theta]$ $\qquad = a[0-(-\sin\theta)]$

$= a\sin\theta$

16th continue

$$\frac{dy}{dx} = \frac{dy/d\theta}{dx/d\theta} = \frac{a\sin\theta}{a[1+\cos\theta]} = \frac{\sin\theta}{(1+\cos\theta)}$$

$$\frac{dy}{dx} = \frac{2\sin\frac{\theta}{2}\cos\frac{\theta}{2}}{2\cos^2\frac{\theta}{2}} = \frac{\sin\frac{\theta}{2}}{\cos\frac{\theta}{2}} = \tan\frac{\theta}{2}$$

(17)

Given equation $f(x) = x^3 - 6x^2 + 9x + 15$.

$\therefore \frac{d f(x)}{dx} = \frac{d}{dx}[x^3 - 6x^2 + 9x + 15]$ $\left[\because \frac{d}{dx}x^n = nx^{n-1}\right]$

$f'(x) = \frac{d}{dx}x^3 - 6\frac{d}{dx}x^2 + 9\frac{d}{dx}x + \frac{d}{dx}(15)$

$\Rightarrow 3x^{3-1} - 6(2x^{2-1}) + 9(1) + 0$

$f'(x) \Rightarrow 3x^2 - 12x + 9.$

If $\frac{df}{dx} = 0 \Rightarrow 3x^2 - 12x + 9 = 0$

$\Rightarrow 3x^2 - 3x - 9x + 9 = 0$

$\Rightarrow 3x(x-1) - 9(x-1) = 0$

$\Rightarrow (x-1)(3x-9) = 0$ ie $x = 1$ or $3x - 9 = 0$

$\Rightarrow x = 3$

If $x = 1$ Maximum value of

$\therefore f(x) = 1 - 6 + 9 + 15$

$= 19.$

If $x = 3$ minimum value of

$f(x) = 27 - 54 + 27 + 15$

$= 15$

$f''(x) = \frac{d}{dx}(f'(x)) = 6x - 12$

For $x = 1 \Rightarrow f''(x) = -6 < 0$

So $f(x)$ is maximum

For $x = 3 \Rightarrow f''(x) = 18 - 12$

$= 6 > 0$

So $f(x)$ is minimum.

Hint :- $f''(x) = \frac{d}{dx}f'(x) = \frac{d}{dx}[3x^2 - 12x + 9]$

$= 3\frac{d}{dx}x^2 - 12\frac{d}{dx}x + \frac{d}{dx}(9)$

$\Rightarrow 3(2x) - 12 + 0 = 6x - 12$

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(20) Given $4\cos^2\theta - 1 = 0$

$\therefore 4\cos^2\theta = 1 \Rightarrow \cos^2\theta = \frac{1}{4} \Rightarrow \cos\theta = \frac{1}{2}$

$\Rightarrow \theta = 60^\circ$

$$\frac{2\tan\theta}{1-\tan^2\theta} = \frac{2\tan 60}{1-\tan^2 60}$$

$$= \frac{2\times\sqrt{3}}{1-(\sqrt{3})^2} = \frac{2\sqrt{3}}{1-3} = \frac{2\sqrt{3}}{-2} = -\sqrt{3}.$$

(21) $$\frac{2\tan\theta}{1+\tan^2\theta} = \frac{2\tan 60}{1+\tan^2(60)}$$

$$= \frac{2\times\sqrt{3}}{1+(\sqrt{3})^2} = \frac{2\sqrt{3}}{1+3} = \frac{2\sqrt{3}}{4} = \frac{\sqrt{3}}{2}$$

(22)

$$\frac{1-\tan^2\theta}{1+\tan^2\theta} = \frac{1-\tan^2 60}{1+\tan^2 60}$$

$$= \frac{1-(\sqrt{3})^2}{1+(\sqrt{3})^2} = \frac{1-3}{1+3} = \frac{-2}{4} = \frac{-1}{2}$$

(23) Given function [let it be $f(x)$ ]

$$f(x) = x^3 - 6x^2 + 9x + 1$$

$$\therefore \frac{d}{dx}(f(x)) = f'(x) = \frac{d}{dx}(x^3 - 6x^2 + 9x + 1)$$

$$\Rightarrow \frac{d}{dx}x^3 - 6\frac{d}{dx}x^2 + 9\frac{dx}{dx} + \frac{d}{dx}(1)$$

$$= 3x^{3-1} - 6(2x^{2-1}) + 9(1) + 0$$

$$f'(x) = 3x^2 - 12x + 9$$

$$f''(x) = \frac{d}{dx} f'(x) = \frac{d}{dx}(3x^2-12x+9]$$

$$= 3\frac{d}{dx}x^2 - 12\frac{d}{dx}x + \frac{d}{dx}9$$

$$= 3(2x^{2-1}) - 12 + 0$$

$$f''(x) = 6x-12 = 0$$

By doing $f'(x) = 0 \Rightarrow 3x^2-12x+9=0$

$$\Rightarrow 3x^2-3x-9x+9=0$$

$$\Rightarrow 3x(x-1)-9(x-1)=0$$

$$\Rightarrow (x-1)(3x-9)=0$$

$$\Rightarrow x=1 \text{ (or) } 3x-9=0$$

$$\Rightarrow x=3$$

By sub $x=1$ in $f''(x)$

we get $6(1)-12 \Rightarrow 6-12 = -6 < 0$

$\therefore$ $x^3-6x^2+9x+1$ has maximum value at $x=1$

(24) Given $y = 2x^3-3x^2-12x+8$.

$\therefore \frac{dy}{dx} = \frac{d}{dx}[2x^3-3x^2-12x+8]$ $\left[\text{From } \frac{d}{dx}x^n = nx^{n-1}\right]$

$$= 2\frac{d}{dx}x^3 - 3\frac{d}{dx}x^2 - 12\frac{d}{dx}x + \frac{d}{dx}(8)$$

$$= 2(3x^{3-1}) - 3(2x^{2-1}) - 12(1) + 0.$$

$$\frac{dy}{dx} = 6x^2-6x-12$$

and $\frac{d^2y}{dx^2} = \frac{d}{dx}[6x^2-6x-12] = 6\frac{d}{dx}x^2 - 6\frac{d}{dx}x - \frac{d}{dx}(12)$

$$= 6(2x^{2-1}) - 6(1) - 0$$

$$= 12x-6 = 0.$$

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By doing $\frac{dy}{dx} = 0$ we get

$\Rightarrow 6x^2 - 6x - 12 = 0$

$\Rightarrow x^2 - x - 2 = 0$

$\Rightarrow x^2 - 2x + x - 2 = 0$

$\Rightarrow x(x-2) + 1(x-2) = 0$

$\Rightarrow (x-2)(x+1) = 0$

$\Rightarrow (x-2) = 0$ (or) $x+1 = 0$

$\Rightarrow x = 2$ (or) $-1$

For $x = 2$ $\quad \frac{d^2y}{dx^2} = 12(2) - 6 = 24 - 6 = 18 > 0$

so $y$ is having minimum value at $x = 2$

(25) Given $y = x^4 - 6x^2 + 8x + 11$

$\Rightarrow \frac{dy}{dx} = \frac{d}{dx}[x^4 - 6x^2 + 8x + 11]$ $\quad \left(\frac{d}{dx}x^n = nx^{n-1}\right)$

$= \frac{d}{dx}x^4 - 6\frac{d}{dx}x^2 + 8\frac{d}{dx}x + \frac{d}{dx}(11)$

$\Rightarrow 4x^{4-1} - 6(2x^{2-1}) + 8 + 0$

$\frac{dy}{dx} \Rightarrow 4x^3 - 12x + 8$

and $\frac{d^2y}{dx^2} = \frac{d}{dx}\left[\frac{dy}{dx}\right] = \frac{d}{dx}[4x^3 - 12x + 8]$

$= 4\frac{d}{dx}x^3 - 12\frac{d}{dx}x + \frac{d}{dx}(8)$

$= 4(3x^{3-1}) - 12(1) + 0$

$\frac{d^2y}{dx^2} = 12x^2 - 12$

make $\frac{dy}{dx} = 0 \Rightarrow 4x^3 - 12x + 8 = 0$

For $x = 1, -1$ we get $\frac{d^2y}{dx^2} = 0$ and $\frac{dy}{dx} = 0$ so we can not decide minimum value

For $x = 2$ $\quad \frac{d^2y}{dx^2} = 12(2)^2 - 12 = 48 - 12 = 36 > 0$ so $y$ is minimum

(28)

Given $y = 0.5x + 2$

For $x = 2$ $\quad y = 0.5(2) + 2$

$\Rightarrow y = 1 + 2 = 3.$

(29) Given $y = 8x^8$ ; $\frac{dy}{dx} = 64x^n$

$\therefore \frac{dy}{dx} = 8[8x^{8-1}]$ $\left[\frac{d}{dx}x^n = nx^{n-1}\right]$

$\Rightarrow \cancel{64}x^n = \cancel{64}x^7$

$\Rightarrow x^n = x^7 \Rightarrow n = 7$

(31) Given $y = 4x^2$ and $\frac{dy}{dx} = 8x.$

For $x = 5$ $\quad \frac{dy}{dx} = 8(5) = 40$

$x = \frac{1}{2}$ $\quad \frac{dy}{dx} = 8(\frac{1}{2}) = 4$

$x = 2$ $\quad \frac{dy}{dx} = 8(2) = 6$

$x = 3$ $\quad \frac{dy}{dx} = 8(3) = 24$

LTask CUQ's

(12) $\frac{d}{dx} x^3 = ?$

we know that $\frac{d}{dx} x^n = n x^{n-1}$

Here $n = 3$

$\therefore \frac{d}{dx} x^3 = 3 x^{3-1}$

$= 3x^2$

(13) $\frac{d}{dx}(\sqrt{x}) = \frac{d}{dx} x^{1/2}$

Here $n = \frac{1}{2}$ ; we know that $\frac{d}{dx} x^n = n x^{n-1}$

$\frac{d}{dx}\sqrt{x} = \frac{1}{2} x^{\frac{1}{2}-1} = \frac{1}{2} x^{-\frac{1}{2}} = \frac{1}{2} \frac{1}{x^{1/2}}$

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

(14) $\frac{d}{dx}\left[\frac{1}{\sqrt{x}}\right] = \frac{d}{dx}\left[\frac{1}{x^{1/2}}\right] = \frac{d}{dx} x^{-\frac{1}{2}}$

$\therefore$ we know that $\frac{d}{dx} x^n = n x^{n-1}$ ; Here $n = -\frac{1}{2}$

$\therefore \frac{d}{dx}\left(\frac{1}{\sqrt{x}}\right) = -\frac{1}{2} x^{-\frac{1}{2}-1} = -\frac{1}{2} x^{-\frac{3}{2}}$

$= -\frac{1}{2} \frac{1}{x^{\frac{3}{2}}} = -\frac{1}{2\sqrt{x^3}}$

(15) Given $y = 2x + 3$ ; For $x = \frac{1}{2}$

$y = 2\left(\frac{1}{2}\right) + 3 = 1 + 3 = 4$

(16) Given $y = 3x + 1$ ; For $x = -2$

$y = 3(-2) + 1 = -6 + 1 = -5.$

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SA Q's

① Given $\sin 30° \times \cos 30° + \sin 45° \cos 45°$

$\Rightarrow \frac{1}{2} \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}$

$\Rightarrow \frac{\sqrt{3}}{4} + \frac{1}{2} \Rightarrow \frac{\sqrt{3}+2}{4}.$

② Given $\sin 0° + \cos 0° = ?$

$\Rightarrow 0 + 1 = 1.$

③ Given $\operatorname{cosec} 45° - \sec 45° = ?$

we know that $\operatorname{cosec} 45° = \sqrt{2}$ and $\sec 45° = \sqrt{2}$

$\therefore \operatorname{cosec} 45° - \sec 45° = \sqrt{2} - \sqrt{2} = 0$

④ Given $4\cos^2\theta - 1 = 0$

$\Rightarrow 4\cos^2\theta = 1$ $\therefore \operatorname{cosec}\theta = \operatorname{cosec} 60°$

$\Rightarrow \cos^2\theta = \frac{1}{4}$ $= \frac{2}{\sqrt{3}}$

$\Rightarrow \cos\theta = \sqrt{\frac{1}{4}}$

$\Rightarrow \cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$

⑤ In the question $\cos(270-\theta) + \sin(180-\theta) = ?$

In $\mathrm{II}^{nd}$ quadrant [i.e $\theta = 90°-180°$] sin, cosec = +ve

$\therefore \sin(180-\theta) = \sin\theta$

In $\mathrm{III}^{rd}$ quadrant [i.e $\theta = 180-270$] tan, cot = +ve

$\therefore \cos(270-\theta) = -\sin\theta$

$\therefore \cos(27-\theta) + \sin(180-\theta) = -\sin\theta + \sin\theta = 0$

(6) $\sin(-\theta) + \sin(90+\theta) = ?$

we know that $\sin(-\theta) = -\sin\theta$

In $II^{nd}$ quadrant [ie $\theta \Rightarrow 90° \to 180°$] sine is positive

$\therefore \sin(90+\theta) = \cos\theta$

$\therefore \sin(-\theta) + \sin(90+\theta) = -\sin\theta + \cos\theta$

$= \cos\theta - \sin\theta$

(7) $\tan 135° + \sin 240° + \cot 420° = ?$

$\tan 135° = \tan(90+45°) = -\cot 45° = -1$

$\sin 240° = \sin(180+60°) = -\sin 60° = -\frac{\sqrt{3}}{2}$

$\cot 420° = \cot[360+60] = \cot 60° = \frac{1}{\sqrt{3}}$

$\therefore \tan 135° + \sin 240° + \cot 420° = -1 - \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{3}}$

$= \frac{-2\sqrt{3} - 3 + 2}{2\sqrt{3}}$

$= \frac{-2\sqrt{3} - 1}{2\sqrt{3}} = \frac{-[2\sqrt{3}+1]}{2\sqrt{3}}$

(8) Given $y = \frac{x}{2} - 3$.

For $x = 2$ $\therefore y = \frac{2}{2} - 3 = 1 - 3 = -2$

(9) Given $y = 3.5x^2$ and slope $\tan\theta = \frac{dy}{dx} = 7x$.

$\therefore$ at $x = 5$ slope $= 7(x)$

$= 7(5)$

$= 35$

(10) Given function $y = x + \frac{1}{x}$

$\therefore \frac{dy}{dx} = \frac{d}{dx}\left[x + \frac{1}{x}\right] = \frac{d}{dx}x + \frac{d}{dx}\frac{1}{x}$

$= 1 + \frac{d}{dx}x^{-1}$ $\left[\because \frac{d}{dx}x^{n} = nx^{n-1}\right]$

$= 1 + (-1)x^{-1-1}$ [Here $n=-1$]

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

$\therefore \frac{d^2y}{dx^2} = \frac{d}{dx}\left[\frac{dy}{dx}\right] = \frac{d}{dx}\left[1 - x^{-2}\right]$

$= \frac{d}{dx}(1) - \frac{d}{dx}x^{-2}$ [Here $n=-2$]

$= 0 - (-2)x^{-2-1}$

$\frac{d^2y}{dx^2} = 2x^{-3}$

Make $\frac{dy}{dx} = 0 \Rightarrow 1 - x^{-2} = 0 \Rightarrow x = \pm 1$

For $x=1$ $\frac{d^2y}{dx^2} = 2(1)^{-3} = 2 > 0$

So $y$ is minimum for $x=1$

(11) Given function $f(x) = \cancel{(x+k)^{-1}}\ x + \frac{k}{x}$

$\therefore f'(x) = \frac{d}{dx}(f(x)) = \frac{d}{dx}\left[x + \frac{k}{x}\right] = \frac{d}{dx}x + k\frac{d}{dx}\left(\frac{1}{x}\right)$

$= 1 + k\frac{d}{dx}x^{-1}$

we know that $\frac{d}{dx}x^{n} = nx^{n-1}$ ; Here $n=-1$

$\therefore f'(x) = 1 + k(-1)x^{-1-1}$

$f'(x) = 1 - kx^{-2}$

11th centum ⑧

$$f''(x) = \frac{d}{dx} f'(x) = \frac{d}{dx}[1-kx^{-2}]$$

$$= \frac{d}{dx}(1) - k\frac{d}{dx}x^{-2} \quad [\text{Here } n=-2]$$

$$= 0 - k(-2x^{-2-1})$$

$$f''(x) = 2kx^{-3}$$

Given $f(x)$ maximum for $x=-2$

$\therefore f'(x) = 0 \Rightarrow 1-kx^{-2}=0$

$\Rightarrow 1-k(-2)^{-2}=0$

$\Rightarrow 1-\frac{k}{2^2}=0 \Rightarrow \frac{k}{2^2}=1$

$\Rightarrow k=4$

(12)

Given $f(x) = (x-k)^4$

$$f'(x) = \frac{d}{dx}f(x) = \frac{d}{dx}(x-k)^4 \quad \left\{\text{From } \frac{d}{dx}x^n = nx^{n-1}\right]$$

$$= 4(x-k)^{4-1}\frac{d}{dx}(x)$$

$$= 4(x-k)^3$$

Given $f(x)$ is minimum for $x=3$

$\therefore f'(x)=0 \Rightarrow 4(x-k)^3=0$

$\Rightarrow x-k=0 \Rightarrow k=x$

$\Rightarrow k=3$

(13) Given $s = 112t - 16t^2$

For $s$ to be maximum we can make $\frac{ds}{dt}=0$

$$\Rightarrow \frac{ds}{dt} = \frac{d}{dt}(112t-16t^2) = 0 \quad \left\{\text{From } \frac{d}{dx}x^n = nx^{n-1}\right]$$

$$\Rightarrow 112\frac{d}{dt}t - 16\frac{d}{dt}t^2 = 0$$

$$\Rightarrow 112 - 16(2t^{2-1}) = 0$$

$$\Rightarrow 112 - 32t = 0$$

$\Rightarrow 32t = 112$

$\Rightarrow t = 112/32$

$\Rightarrow t = 3.5$ sec

(14) Given $S = t^4 - 10t^3 + 24t^2 + 36t + 12$

velocity $= v = \frac{ds}{dt} = \frac{d}{dt}[t^4 - 10t^3 + 24t^2 + 36t + 12]$

we know that $\frac{d}{dx}x^n = nx^{n-1}$

$\therefore v = \frac{d}{dt}t^4 - 10\frac{d}{dt}t^3 + 24\frac{d}{dt}t^2 + 36\frac{d}{dt}t + \frac{d}{dt}(12)$

$= 4t^{4-1} - 10(3t^{3-1}) + 24(2t^{2-1}) + 36(1) + 0$

$v = 4t^3 - 30t^2 + 48t + 36$

Acceleration $a = \frac{dv}{dt} = \frac{d^2s}{dt^2} = \frac{d}{dt}[4t^3 - 30t^2 + 48t + 36]$

$= 4\frac{d}{dt}t^3 - 30\frac{d}{dt}t^2 + 48\frac{d}{dt}t + \frac{d}{dt}(36)$

$= 4[3t^{3-1}] - 30[2t^{2-1}] + 48 + 0$

$= 12t^2 - 60t + 48$

$\therefore$ By doing $\frac{d^2s}{dt^2} = 0 \Rightarrow 12t^2 - 60t + 48 = 0$

$\Rightarrow t^2 - 5t + 4 = 0$

$\Rightarrow t^2 - 4t - t + 4 = 0$

$\Rightarrow t(t-4) - 1(t-4) = 0$

$\Rightarrow [t-4][t-1] = 0$

$\Rightarrow t - 4 = 0$ (or) $t - 1 = 0$

$\Rightarrow t = 4$ (or) $t = 1$

For $t = 1$ we get $v = 4(1)^3 - 30(1)^2 + 48(1) + \cancel{36}$

$= 4 - 30 + 48 + \cancel{36} = \cancel{94} = +ve$

$a = 0$

For $t = 4$, $v = 4 \times 4^3 - 30(4)^2 + 48(4) + \cancel{36}$

$= 256 - 480 + 192 + \cancel{36} =$

$\cancel{a} = \Rightarrow 368 - 480 = -112 = -ve$ ie Body is slowing ~~down~~ and also acceleration is $-ve$.

9th [illegible]

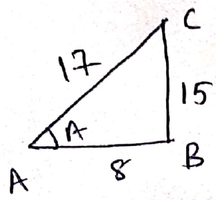
WS-1

LTask

Foundation +

23, 24, 25

23 Acc to given data $15\cos A - 8\sin A = 0$




$\Rightarrow 15\cos A = 8\sin A$

$\Rightarrow \tan A = \frac{\sin A}{\cos A} = \frac{15}{8}$

Acc to Pythagorous theorem

$AC^2 = AB^2 + BC^2$

$\Rightarrow AC^2 = 8^2 + 15^2 = 64 + 225$

$\Rightarrow AC^2 = 289 \Rightarrow AC = \sqrt{289}$

$\Rightarrow AC = 17$

$\therefore \sin A = \frac{15}{17}$

$\cos A = \frac{8}{17}$

23

$$\therefore \frac{\sin A + \cos A}{2\cos A - \sin A} = \frac{\frac{15}{17} + \frac{8}{17}}{2\times\frac{8}{17} - \frac{15}{17}} = \frac{\frac{15+8}{\cancel{17}}}{\frac{16-15}{\cancel{17}}} = \frac{23}{1} = 23$$

24

$$\frac{15\cot A + 17\sin A}{8\tan A + 16\sec A} = \frac{\cancel{15}\times\frac{8}{\cancel{15}} + \cancel{17}\times\frac{15}{\cancel{17}}}{\cancel{8}\times\frac{15}{\cancel{8}} + \overset{2}{\cancel{16}}\times\frac{17}{\cancel{8}}} = \frac{8+15}{15+34} = \frac{23}{49}$$

25

$$\frac{\sec A - \operatorname{cosec} A}{\operatorname{cosec} A + \sec A} = \frac{\frac{17}{8} - \frac{17}{15}}{\frac{17}{15} + \frac{17}{8}} = \frac{\cancel{17}\left[\frac{15-8}{\cancel{15\times8}}\right]}{\cancel{17}\left[\frac{8+15}{\cancel{15\times8}}\right]} = \frac{7}{23}$$

26 Given $y = 2.5(x) + 5$

for $x = \frac{1}{2}$ ; $y = 2.5\left(\frac{1}{2}\right) + 5 = 1.25 + 5 = 6.25$

27 Given $y = 8x + 12$

For $x = 2.8$ : $y = 8(2.8) + 12 = 22.4 + 12 = 34.4$

(28) Given $y = 12.6x + 1.8$

For $x = \frac{1}{4}$ $\therefore$ $y = 12.6 \times \frac{1}{4} + 1.8$

$= 3.15 + 1.8$

$= 4.95$

(29) Given that $2\sin^2 30° - 3\cos^2 45° + \tan^2 60° = ?$

$\Rightarrow 2\left[\frac{1}{2}\right]^2 - 3\left[\frac{1}{\sqrt{2}}\right]^2 + [\sqrt{3}]^2$

$\Rightarrow \cancel{2} \times \frac{1}{\cancel{4}2} - \frac{3}{2} + 3$

$= \frac{1}{2} - \frac{3}{2} + 3 = \frac{1-3}{2} + 3$

$= -\frac{2}{2} + 3 \Rightarrow -1 + 3 = 2.$

(30) Given $h = 1280t - 16t^2$

To find maximum height, first do $\frac{dh}{dt} = 0$

$\Rightarrow \frac{d}{dt}(1280t - 16t^2) = 0$

$\Rightarrow 1280\frac{dt}{dt} - 16\frac{d}{dt}t^2 = 0$ $\left[\frac{d}{dx}x^n = nx^{n-1}\right]$

$\Rightarrow 1280 - 16(2t^{2-1}) = 0$

$\Rightarrow 1280 - 32t = 0 \Rightarrow 32t = \cancel{1280}^{40}$

$t = 40$ sec.

$\therefore$ $h = 1280(40) - 16(40)^2$

$= 51200 - 16 \times 1600$

$= 51200 - 25600$

$\Rightarrow h = 25600 \Rightarrow \underline{256 \times 10^2}$ ft

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9th foundation +

WS - 1 1 bark

32

Given $y = 6x^2$ ; slope $= \frac{dy}{dx} = 12x$.

At $x = 3$ $\rightarrow$ slope $= 12(3) = 36 = 6^2$

$x = 1.5$ $\rightarrow$ slope $= 12(1.5) = 18$

$x = 2$ $\rightarrow$ slope $= 12(2) = 24$

$x = 2.5$ $\rightarrow$ slope $= 12(2.5) = 30$.