Physics

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#L1

* Mathmatical tools *

#Common Kidnapping

$\Rightarrow 30\times2+30 = 30(2+1) = 30(3) = 90$

$\Rightarrow 188\times9+66\times3 = 9(188+22) =$ (÷3, ×3)

$\Rightarrow (10^2+70^2) = 10^{②}(1^{②}+7^{②}) = 100(50) = 5000$ (out Hen common)

$\Rightarrow x = R\sqrt{3}$ ↓

$\Rightarrow \sqrt{(x^2+R^2)} = \sqrt{(R\sqrt{3})^2+R^2} = \sqrt{(R\sqrt{3}\times R\sqrt{3})}+R^2 = \sqrt{R^2 3+R^2} = \sqrt{4R^2} = 2R$ ✗

$= \sqrt{(R\sqrt{3})^2+R^2} = \sqrt{R^2 3+R^2} = \sqrt{(R^2)(3+1)} = \sqrt{4R^2} = 2R$ ✓

$x \Rightarrow \sqrt{(7R^2)} = \sqrt[3]{(x^2+R^3)} = 3\sqrt{7R^3+R^3} = 3\sqrt{8R^3} = 2R$ ✓

$\Rightarrow 3\sqrt{27000} = 3\sqrt{27\times1000} = 3\times10 = 30$ ✓

#LCM

$\Rightarrow (60,40) = 20(3\times2) = 120$

$\Rightarrow (144,60) = 12(12\times5) = 12(60) = 720$

#Fractions to Decimals

$= \frac{1}{2}^{0.5} \quad = \frac{1}{3}^{0.3} \quad = \frac{1}{4}^{0.25}$

So, $\frac{8}{3} = 2\frac{2}{3}$ (2 left) So, 0.6 $\{2+0.6\} = 2.\overline{66}$

$= \frac{55}{3}^{18.2} = 18+\frac{1}{3} = 18+0.2 = 18.2$

$\neq \frac{1}{5} =$ Numinate $2\times2 = 0.2$ ↳ Last digit desimal

$= \frac{33}{5} = 6.6 \quad = \frac{124}{5} \xrightarrow{\times2} 24.8 = \frac{135}{5} = 27$

$\neq \frac{1}{6} = 0.166666\ldots$

$= \frac{1}{7} = 0.1421$

$= \frac{1}{8} = 0.125$

$= \frac{1}{9} = 0.\overline{111} \quad = \frac{2}{9} = 0.\overline{222} \quad = \frac{3}{9} = 0.\overline{333} = \frac{20^2}{9}, 2 = 2.\overline{222} = \frac{100}{9}^{11} = 1 \Rightarrow 11.\overline{111}$

#Equivalent Fractions

$= \frac{1}{2} \overset{\times4}{=} \frac{x}{8} = \frac{4}{8}$ (×4)

$= \frac{7}{11} \overset{11}{=} \frac{x}{121} = \frac{77}{121}$ (Same) $= \frac{3}{7} \overset{9}{=} \frac{x}{63} = \frac{27}{63}$

LCM and Fraction

$\Rightarrow \frac{1}{2}+\frac{3}{4} = \frac{1}{2}\left(1+\frac{3}{2}\right)$ → Use common for fraction

$\Rightarrow \frac{7}{11}-\frac{2}{121} = \frac{1}{11}\left(7-\frac{2}{11}\right)$

$= \frac{1}{11}\left(\frac{75}{11}\right) \Rightarrow \frac{75}{121}$

{ This work when Denominator divides }

1

$\Rightarrow 1+\frac{1}{8} = \frac{9}{8}$ → Denominater same

$\Rightarrow 1-\frac{1}{9} = \frac{8}{9}$

$\therefore \Rightarrow 1\left(\frac{2}{121}\right) = \frac{119}{121}$

8 ⊞ 1

$\frac{\frac{x}{y}}{\frac{a}{b}}$

$= \frac{2}{\frac{3}{5}}$ (opposite) ÷ → or 2 divide $\frac{3}{5}$

$\Rightarrow 2 \times \frac{5}{3}$

Decimals addition, Subtraction Rules (Point se point milao)

$\Rightarrow 0.2+0.3 = \frac{0.2}{0.3}$ A+

$\Rightarrow 0.20+0.03 = \frac{0.20}{+0.03}$ / 0.23

$\Rightarrow 8.27-1.99 = \frac{8.27}{1.99}$ / 6.28

Decimal Multiply

$\Rightarrow 0.2 \times 0.3 = 0.06$

$\Rightarrow 0.\frac{2}{3} \times 0.\frac{03}{2} = 0.\frac{006}{3}$

$\Rightarrow \frac{0.2}{0.3}$ (If same so (hatao)) $\Rightarrow \frac{2}{3} = 0.\bar{6}$

$\Rightarrow 0.12 \times 0.005 = \frac{12}{100} \times \frac{5}{1000} = \frac{60}{100000} = 0.0006$ (3 → zero; ↳ after point 4)

$\Rightarrow \frac{0.3}{0.04} = \frac{3}{0.4} = \frac{30}{4} \times$

$\frac{0.30}{0.04}$ (add) $= \frac{30}{0.4} = \frac{30}{4}$ ✓

$\Rightarrow 99.9 \times 0.5$

$\frac{999}{10} \times \frac{5}{10} = \frac{4995}{100} = 49.95$

$\Rightarrow \frac{6.9}{1.44} = \frac{6.90}{1.44} = \frac{690}{144} \frac{230}{48} = \frac{115}{24}$

⇒ PUPPY POINT-1

- Common Kidnapping $4+8 = 4(1+2) = 4\times3 = 12$
- LCM = Le common kar multiply $= 6,9 = 3(2,3) = 18$
- Equivalent fraction = $\frac{2}{3} \overset{\times 8}{=} \frac{x}{24} = \frac{16}{24}$
- Fraction Addition = $\frac{1}{11}-\frac{8}{99} = \frac{1}{11}\left(1-\frac{8}{9}\right) = \frac{1}{11}\left(\frac{1}{9}\right) = \frac{1}{99}$
- Fraction Division & Multiplication Rule :- $2 \div \frac{2}{5}$ & $\frac{2}{3} \div 5 \rightarrow 2 \times \frac{5}{2}$ & $\frac{3}{2} \times 5$
- Decimals Addition, Subtraction Rules :- Point se point mila
- Decimals Multiply, Division Rule :-

  Point (Gino) + $\frac{x}{10^x}$

  Shift Karna

L2

$\Rightarrow \frac{1}{6} = 0.1666$ $\Rightarrow \frac{5}{6} = 0.833$ $\Rightarrow \frac{1}{7} = 0.142857$ $\Rightarrow \frac{1}{8} = 0.125$

$x^0 = 1$
$x^1 = x$
$x^2 = x \times x$
$x^2 = x \times x \times x \times x$

$2^0 = 1$
$2^2 = 4$
$2^3 = 8$
$2^4 = 16$
$2^5 = 32$
$2^1 = 2$
→ Number increass

$0.1^0 = 1$
$0.1^1 = 0.1$
$0.1^2 = 0.01$
$0.1^3 = 0.001$
→ Less not increass → When Increass

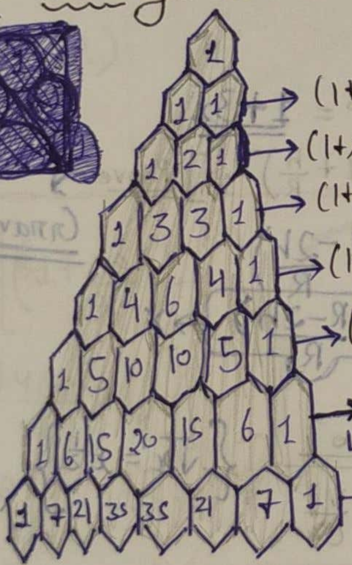
Q. $x > 1$ then $A = x^4$, $B = x^6$
$\Rightarrow x^n = n \downarrow$ (grater)
$x^6 =$ High (grater)
$\Rightarrow x^4 =$ High when $x < 1$

$\Rightarrow (1 + 0.001)^{100} \approx 1$
$\Rightarrow 1 + (0.1)^2 + (0.1)^3 + (0.1)^4 \ldots$ (small, very small, very very small)
$\Rightarrow 1 + 0.1$ → Ignore
$\Rightarrow 1.1$ ✓

[Very Small = Ignore]

Pascal's Triangle

(Not in syllabus)



$(1+x)^1 =$ • Ignore
$(1+x)^2 = 1 + 2x + x^2$ ✗
$(1+x)^3 = 1 + 3x + 3x^2 + x^3$ ✗
$(1+x)^4 = 1 + 4x + 6x^2 + 4x^3 + x^4$ ✗
$(1+x)^5 = 1 + 5x + 10x^2 + 10x^3 + 5x^4 + x^5$ ✗
$(1+x)^6 = 1 + 6x + 15x^2 + 20x^3 + 15x^4 + 6x^5 + x^6$ ✗
→ Start by $1 + x^2 + x^3 + x^4 \ldots x^n$ → $(1+x)^n$
$(1+x)^7 = 1 + 7x + 21x^2 + 35x^3 + 35x^4 + 21x^5 + 7x^6 + 1x^7$

$\Rightarrow (1+x)^6 = (1 + 6x)$
So, $(1+x)^n = (1 + nx)$] $x << 1$

* If $x << 1$ then,
• $(1+x)^5 = (1 + 5x)$
• $(1+x)^{100} = (1 + 100x)$
• $(1+x)^{-3} = (1 - 3x)$
• $(1+x)^{-0.5} = (1 - 0.5x)$

Binomial Approximation

$\Rightarrow$ If $x << 1$
So, $(1+x)^n = (1 + nx)$

Q $\Rightarrow (1.1)^{10} = (1 + 0.1)^{10} = (1 + 10(\frac{1}{10})) = 1 + 1 = 2$

Q $\Rightarrow (1.05)^5 = (1 + (0.05)5) = 1 + \frac{5}{100} \times 5 = 1.25$

Q $= (1.0004)^{500} = (1 + 0.0004(500))$
$= 1 + \frac{4 \times 500}{10000}$; $4 \times 500 = 2000 = 0.2$
$= \frac{6}{5} = 1.2$

Q. $(10.1)^2 = (10 + 0.1)^2 = X$
$(10 + 2(0.1)) = ✗$
$(10 + \frac{0.1}{10} \times 10)$; So $= 1$
Common
$= 10^2 (1 + \frac{0.1}{10})^2$
$= 10^2 (1 + \frac{0.01}{10} \times 2)$
$= 10^2 (1 + \frac{1}{5}) = 10(\frac{6}{5}) = \frac{600}{5} = 12$

$\Rightarrow (10.1)^2$

$= (10+0.1)^2$

= Common

So, Batche kayda

$= \left(10 + \frac{0.1 \times 10}{10}\right)^2$

$= 10^2\left(1+\frac{0.1}{10}\right)^2$

$= 10^2\left(1+2\times\frac{0.1}{10}\right)$ → $\left[10^2\left(1+\frac{1}{2}\left(\frac{0.1}{10}\right)\right)\right]$

$= 10^2(1+0.2)$

$= 10^2(1.2)$

$= 100(1.2)$

$= 102$ Ans

$\left[10^2\left(1+\frac{0.1}{5}\right) \rightarrow \text{Double one point } 0.02\right]$

$\Rightarrow (5+0.0003)^3$

$= 5^3\left(1+\frac{0.0003\times 3}{5}\right)$

$= 125\left(1+\frac{0.0009}{5}\right)$

$= 125\left(\frac{5.0009}{5}\right)$

$= 25\left(\frac{500.09}{500}\right)$

$= \frac{500.09}{4}$

$= \frac{500.09}{400}$

$= 125.09$

★ $(a+x)^n = a^n\left[1+\frac{nx}{a}\right]$

★ $\left[(a+x)^n = (a+nx)\right]$

$\Rightarrow (1+x)^3 = 1+3x$

$\Rightarrow g_n = g_0\left(1+\frac{h}{R}\right)^{-2}$] Prove → Gravitation

$= g_n = g_0\left(1-\frac{2h}{R}\right)$

$= g_n = g_0\left(\frac{R-2h}{R}\right)$ → ×

$\Rightarrow m = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}$ · $\{\sqrt{x} = x^{\frac{1}{2}}\}$

$\Rightarrow m = \frac{m_0}{\left(1-\frac{v^2}{c^2}\right)^{\frac{1}{2}}}$

$= m = m_0\left(1-\frac{v^2}{c^2}\right)^{-\frac{1}{2}}$ ← upper toh negative.

$= m = m_0\left(1+\frac{v^2}{2c^2}\right)$ → ×

#L3

$x = (100001)^{\frac{1}{5}}$

$\Rightarrow (100000+1)^{\frac{1}{5}}$

$= 100000^{\frac{1}{5}}\left(1+\frac{1}{5}\times\frac{1}{100000}\right)$

$= 10^{5\times\frac{1}{5}}\left(1+\frac{1}{500000}\right)$

$= 10\left(1+\frac{1}{5\times10^5}\right)^{\frac{1}{5\times10^0}}$] Very small

$= 10\left(1+\frac{0.2}{10^5}\right) = 10\left(1+\frac{0.2}{100000}\right)$

जितना Zero Utna point ke baad Zero

$= 10(1+0.2\times10^{-5})$

$= 10(1+0.000002)$

$= 10(1.000002)$

$= 10.000002$

$\Rightarrow \sqrt{y} = (y)^{\frac{1}{2}}$

$\Rightarrow \sqrt{0.98} = (0.98)^{\frac{1}{2}} = (1-0.02)^{\frac{1}{2}}$

$= 1-\frac{0.02}{2}$

$= 1-\frac{2}{200}$

$= \frac{99}{100} = \boxed{0.99}$

$\Rightarrow m = \frac{m^0}{\sqrt{1-\frac{v^2}{c^2}}} \Rightarrow m = m_0\left(\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}\right)$

$\Rightarrow \frac{m^0}{\left(1-\frac{v^2}{c^2}\right)} \Rightarrow m_0\left(1-\frac{v^2}{c^2}\right)^{\frac{-1}{2}} \Rightarrow m^0 = 1+\frac{v^2}{2c^2}$

$\Rightarrow m^0 = 20\left(1+\frac{8\times10^8\times8\times10^8}{2\times8\times10^8\times8\times10^8}\right)$

$\Rightarrow m_0 = 20\left(1+\frac{1}{200}\right)$

$\Rightarrow m_0 = 20+\frac{20}{200} \Rightarrow m_0 = \frac{1}{10}+20 \Rightarrow \boxed{20.1}$

$\Rightarrow E = K\left[\left(1+\frac{\Delta\theta}{\theta_0}\right)^4-1\right]$

$= K\left[\left(1+\frac{4\Delta\theta}{\theta_0}-1\right)\right]$

$= K\left[\frac{4\Delta\theta}{\theta_0}\right]$

⇒ Squares & Cube & Roots.

$\Rightarrow (65)^2 = 42\ 25$

6×7, $+1$, $\times$

$\Rightarrow (75)^2 = 5625$

7×8

$\Rightarrow (105)^2 = 11025$

10×11

$\Rightarrow \sqrt{0.98} = \sqrt{\frac{98}{100}} = \frac{0.98}{10}$

$\boxed{0.98}$ Ans

$\Rightarrow (97)^2 = 94\ 09$

• $100-3$, -3, Square, Square

$99-90$ or $101-109$

Valid 90 to 110

* Valid for 40 to 60

$(42)^2 = 17\ 64$

$\Rightarrow 50-8$

$\Rightarrow 25-8$

$\frac{3b_2}{6} \pm c = b \pm \frac{c}{6}$

Square root

$\Rightarrow (\ )^{\frac{1}{2}} = \sqrt{\ }$

- $\sqrt{125} = \sqrt{5\times5\times5} = 5\sqrt{5}$

- $\sqrt{1} = 1$
- $\sqrt{2} = 1.414$
- $\sqrt{3} = 1.732$
- $\sqrt{5} = 2.236$
- $\sqrt{10} = 3.16 \approx \pi$
- $(\pi)^2 = 10$

} Learn

* puppy *

$\Rightarrow \sqrt{29} = \sqrt{25+4}$

$= 5 + \frac{4^2}{2\times5} = 5 + \frac{2}{5} = 5 + 0.4 \approx 5.4$

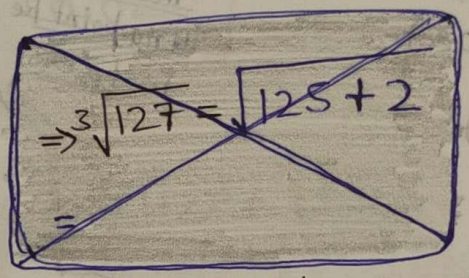
$\Rightarrow \sqrt{23} = \sqrt{25-2}$

$= 5 - \frac{2}{2\times5} = 5 - \frac{1}{5} = \frac{24}{5} = 4.8$

$\Rightarrow$ x → close = n ± z / 2n → what add or subtract (+ / −)

$\Rightarrow \sqrt{12} = \sqrt{4\times3} = 2\sqrt{3} = 2\times1.732$

$= 3.464$ Ans



Cube $= x^3 = x\times x\times x$

$(\ )^{\frac{1}{3}}$ or $\sqrt[3]{\ }$

$\sqrt[3]{250} = \sqrt[3]{2\times5\times5\times5}$

$= 5\sqrt[3]{2}$

Surds → powers (Granda!)

$\Rightarrow x^{\frac{5}{6}} = \left(x^5\right)^{\frac{1}{6}} = \sqrt[6]{x\times x\times x\times x\times x} = \left(x^{\frac{1}{6}}\right)^5 = \left(\sqrt[6]{x}\right)^5$

Ex: $8^{\frac{2}{3}} = \left(8^2\right)^{\frac{1}{3}} = \sqrt[3]{8\times8} = \sqrt[3]{64} = \boxed{4}$

* Puppy point - 3

- Binomial approximation = • $(1+x)^n = (1+nx)$
  • $(a\pm x)^n = a^n\left(1 \pm \frac{nx}{a}\right)$ ✯

- Square root = • $\sqrt{2} = 1.414$ | • $\sqrt{3} = 1.732$ | $\left[\sqrt{p^2 \pm e} = p \pm \frac{e}{2p}\right]$
  • $\sqrt{5} = 2.236$ | $\sqrt{10} \approx \pi = 3.16$

- Cube root = • $\sqrt[3]{8} = \sqrt[3]{2\times2\times2} = 2$

✯✯✯ → • $\boxed{\sqrt[3]{p^3 \pm e} = p \pm \frac{e}{3p^2}}$

#L4

#Logarithms (Log)

⇒ Power $0 = 1$

⇒ Power 1 = Same

⇒ 234 (Subscript) / (Superscript)

⇒ $\log_b a$ = log of a base b

⇒ Mathematical Function:

- $\log_2 512 = 9$

So, $2^x = 512$

$x = 9$

So, $\log_2 512 = 9$

⇒ {Base ki power me kiya ki 512 aa jaye.}

⇒ $\log 1 = 0$
⇒ $\log 2 = 0.3$
⇒ $\log 3 = 0.48$
⇒ $\log 4 = 0.6$
⇒ $\log 5 = 0.7$
⇒ $\log 6 = 0.78$
⇒ $\log 7 = 0.84$
⇒ $\log 8 = 0.9$
⇒ $\log 9 = 0.96$
⇒ $\log 10 = 1$

$2^0 = 1$
$2^1 = 2$
$2^2 = 4$
$2^3 = 8$
$2^4 = 16$
$2^5 = 32$
$2^6 = 64$
$2^7 = 128$
$2^8 = 256$
$2^9 = 512$
$2^{10} = 1024$

$2^4 = 16$
$3^4 = 81$
$4^4 = 256$
$5^4 = 625$

{$1000 = 10^3$}

⇒ $\log_x 1 = 0$

$x^\square = 1 \Rightarrow x^\circ = 1$

⇒ $\log_x x = 1$

$x^\square = x \Rightarrow x^1 = x$

⇒ If no base So, It = 10

- $\log 5 = \log_{10} 5$

#Rule 1

⇒ [$\log(ab) = \log a + \log b$] → $\log 4 = \log(2 \times 2) = \log 2 + \log 2 = 0.3 + 0.3 = \boxed{0.6}$

⇒ [$\log\left(\frac{a}{b}\right) = \log a - \log b$] → $\log\left(\frac{1}{4}\right) = \log 1 - \log 4 = 0 - 0.6 = \boxed{-0.6}$

⇒ $\log\left(\frac{1}{a}\right) = -\log a$

Decimal log

⇒ $\log(2.5) = \log\left(\frac{25}{10}\right) = \log\left(\frac{5}{2}\right) = \log 5 - \log 2 = 0.7 - 0.3 = 0.4$

⇒ $\log a^x = x \log a$

Ex. $\log 1024 = \log 2^{10} = 10 \log 2 = 10(0.3) = \boxed{3}$

⇒ $\log(5 \times 10^7) = \log 5 + \log 10^7 = 0.7 + 7 = \boxed{7.7}$

⇒ $\log(1.25 \times 10^5) = \log \frac{5}{4} + -5 \log 10 = 0.1 - 5 = \boxed{-4.9}$

#Reverse

⇒ $\log_3 7 = \frac{\log 7}{\log 3} = \frac{0.84}{0.48} = \frac{84}{48} = \frac{21}{12} = \frac{7}{4}$

[No a-b work]

Not in Syllabus

Puppy point 4

⇒ 2 Power, $\log(1 \cdot 10)$

⇒ $\log(ab) = \log a + \log b$

⇒ $\log\left(\frac{a}{b}\right) = \log a - \log b$

⇒ $\log\left(\frac{1}{a}\right) = -\log a$

⇒ $\log a^x = x \log a$

⇒ $\log 10^x = x$

⇒ $\log_b a = \frac{\log a}{\log b}$] No Subtraction

• Except 10 ←

* Prime number ⇒ Log 17 So, log16 = 1.20] 1.23
log18 = 1.26.

⇒ $\log\sqrt{27} \Rightarrow \log(27)^{\frac{1}{2}}$

⇒ $\log 3^{3 \times \frac{1}{2}}$

⇒ $\frac{3}{2}\log 3$

⇒ $\frac{3}{2} \times 0.48 \Rightarrow$ 0.72

5

⇒ $\log_3 2 \log_2 3$

⇒ $\frac{\log 2}{\log 3} \times \frac{\log 3}{\log 2} = 1$

⇒ $\frac{0.3}{0.48} \times \frac{1.61}{1}$

⇒ 1

⇒ Log 2 log 3

⇒ 0.3 × 0.48

⇒ 0.144 Ans

⇒ $\log 3^2 \log 2^3$

⇒ $2\log 3 \times 3\log 2$

⇒ 2(0.48) × 3(0.3)

⇒ 0.96 × 0.9

⇒ 0.864

⇒ $\log\frac{2}{3} \log\left(\frac{3}{2}\right)$

⇒ −0.18 × 0.18

⇒ −0.0324

Antilog

⇒ log x = 0.3 • Find x = 2

⇒ log x = 0.7 • Find x = 5

⇒ $\log_3 x = 4$ • Find x = $3^4 = x \Rightarrow 81$

⇒ $\log_c x = y$ ⇔ $c^y = x$

Rule 4

⇒ e = 2.72

⇒ Base = e } Natural log

* Eg. = Natural log of 2

⇒ $\log_e 2$ or $\ln 2$

* ln = 2.303

So, $\ln 10 = 2.303 \log 10 = 2.303$

Puppy point 5

⇒ $\log_{10} x = x$

⇒ $\log_c a = \frac{\log a}{\log c}$

⇒ $\log_c x = y \Rightarrow c^y = x$

⇒ $\ln \cdot \log_e x = 2.303$

⇒ $\log_c x^a = a \log_c x = \frac{a \log x}{\log c}$

Solve First

* ⇒ $\log_2 25^3 \Rightarrow 3\log_2 25$

⇒ $3\frac{\log 25}{\log 2}$

⇒ $3\left(\frac{1.4}{0.3}\right)$

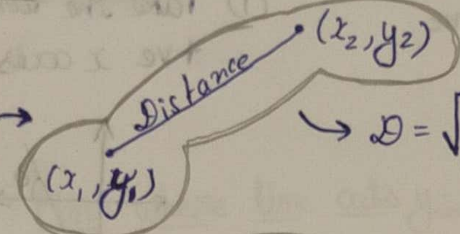
⇒ 14

#Li6

$\Rightarrow \log_e x = \frac{\log x}{\log e} = \frac{\log x}{\log 2.72} = \frac{\log x}{0.303} = 2.303$ } www

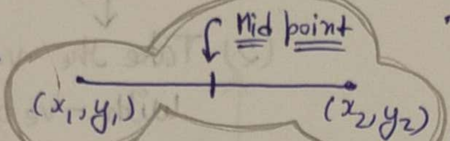
#Graphs

Distance formula →

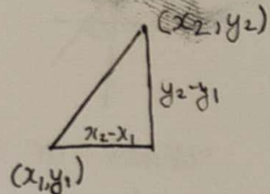


→ $D = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$

Midpoint formula →



} $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

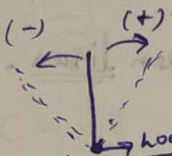


$\Rightarrow H = \sqrt{P^2 + B^2}$

$\Rightarrow D = \sqrt{(y_2-y_1)^2 + (x_2-x_1)^2}$

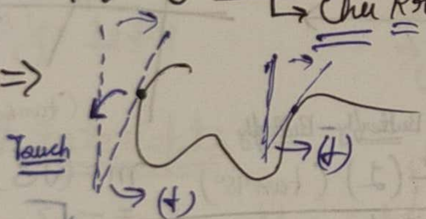
#Slope (Dhalaan) (m)

$\Rightarrow$ ——— $m = 0$ | $m = \infty$



Loest point of line (Butterfly method)

↳ Slop find by tangent
↳ Chu kr mere graph, ek point tangent tune mare!



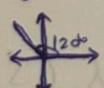
* {Magnitude = Ignore + and −}
↳ Eg Magnitude of −10 is 10.

$\Rightarrow \tan 30° = \frac{1}{\sqrt{3}}$
$\Rightarrow \tan 45° = 1$
$\Rightarrow \tan 60° = \sqrt{3}$
$\Rightarrow \tan 37° = \frac{3}{4}$
$\Rightarrow \tan 53° = \frac{4}{3}$

{⇒ Slope :- $\tan\theta$ = ~~$\frac{x^2-x^1}{y^2-y^1}$~~ = $\frac{y^2-y^1}{x^2-x^1}$ }

⇒ Left angle = −θ

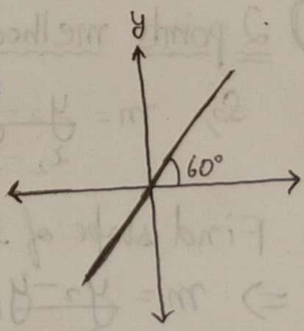
Eg :-



⇒ 180 − 120
= 60° {from left}
= − (Tan 60°)
= $-\sqrt{3}$

* Slope = Tan 60° = $\sqrt{3}$
* Slope = $\sqrt{3}$

⇒ (+) ⇒ Angle ↑ Slope ↑
⇒ (−) ⇒ Angle ↑ Slope ↓



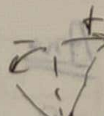
#Pukky point #6

• $D = \sqrt{(x_2-x_1) + (y_2-y_1)}$ • $\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}$. • ——— $m = 0$

• Slope. tangent that touch one point.

⇒ Slope = $\frac{y_2-y_1}{x_2-x_1}$, [• $\tan\theta = \frac{\sin\theta}{\cos\theta}$]

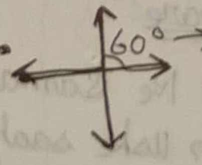
• Butterfly



• | $m = \infty$

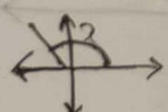
• $\tan 37 \Rightarrow \frac{3}{4}$ • Same are $53° = \frac{4}{3}$

•



→ Tan 60° = $\sqrt{3}$

•



⇒ 180 − x
⇒ θ ↳ tan θ But Negative (−).

#L7

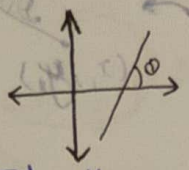
$y = mx + c$

⇒ Equation of straight line

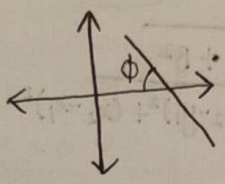
$y = mx + c$

m is pole

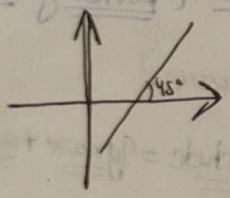
(1) Take the tan of angle made by line with +ve x axis. ($m = \tan\theta$)



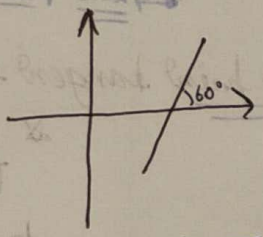
(2) Take the -ve of tan of angle made by line with -ve x axis. ($m = -\tan\phi$)



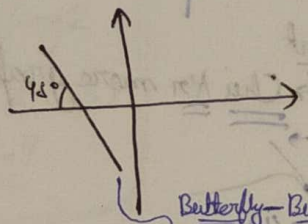
Q. Find m(slope) for the given lines.



$m = 1\ (\tan 45°)$



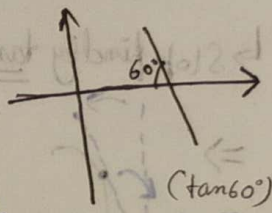
$m = \sqrt{3}\ (\tan 60°)$



Butterfly–Butterfly

$m = -(1)\ (\tan 45°)$

$= -1$



$(\tan 60°)$

$m = (\sqrt{3}) -$

$= -\sqrt{3}$

(3) 2 points method (x_2, y_2) and (x_1, y_1)

So, $m = \dfrac{y_2 - y_1}{x_2 - x_1}$

Q. Find slope of line passing through (1,2) & (5,8)

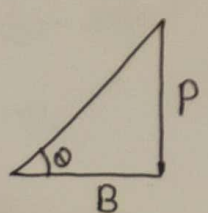
$\Rightarrow m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{6}{4} = \dfrac{3}{2}$ Ans

Q. Find slope of line passing through (0,7) & (20,67)

$m = \dfrac{360}{20} = 3$ Ans

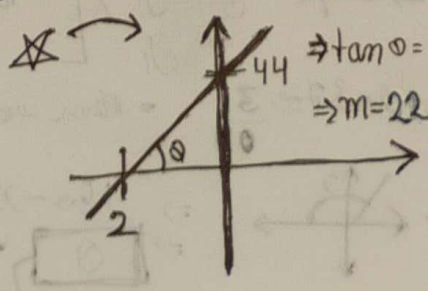
↳ No Square

$m = \dfrac{3600}{400} \Rightarrow m = 9$ Ans ✗



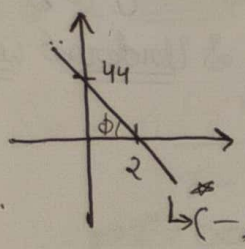
⇒ θ ke samane P.

↳ Uske saat joint B. ⇒



$\Rightarrow \tan\theta = \frac{P}{B} = \frac{44}{x}$

$\Rightarrow m = 22$



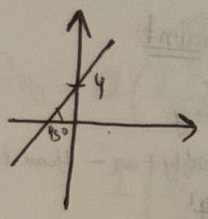
$= \tan\theta = \frac{22}{x}$

$= So, \tan\theta = \frac{44}{2}$

$= -22$ Ans

$\Rightarrow y = mx + c$

y-intercept: Place where line cuts y-axis

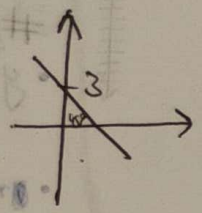


* $m = \tan 45°$
$= 1$

* $c = 4$

$\Rightarrow y = mx + c$

$\Rightarrow y = 1x + 4$

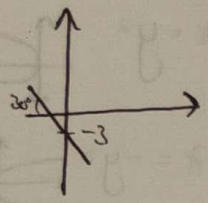


* $m = \tan 45$
$= -1$

* $c = 3$

$\Rightarrow y = mx + c$

$\Rightarrow y = -1x + 3$

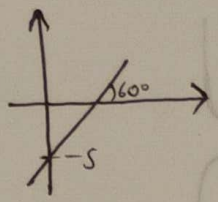


* $m = \tan 30°$
$= \frac{-1}{\sqrt{3}}$

* $c = -3$

$\Rightarrow y = mx + c$

$\Rightarrow y = \frac{-x}{\sqrt{3}} - 3$



* $m = \tan 60°$
$= \sqrt{3}$

* $c = -5$

$\Rightarrow y = mx + c$

$\Rightarrow \sqrt{3}x - 5$

Intercepts :

y-intercept → Jaha y axis ko katoo....

x-intercept → Jaha x axis Ko Katoo....

$\Rightarrow y = mx + c$

* y intercept = c

$\Rightarrow x \rightarrow \boxed{y = 0}$

• $y = mx + c$

$0 = mx + c$

$\boxed{m = \frac{-c}{x}}$

* x-intercept $= \frac{-c}{m}$

2. $2y = 3x - 6$ (find x and y)

$y = \frac{3x}{2} - \frac{6}{2}$

* (for strait line)

$y = \frac{-6}{2}$ $y = -3$

$x = \frac{-(-6)}{\frac{3}{2}} = \frac{6}{\frac{3}{2}} = 3$

$\boxed{y = -3}$

$\boxed{x = 2}$

Puppy

x So, $\boxed{y = 0} \rightarrow x = 2$

y So, $\boxed{x = 0} \rightarrow y = -3$

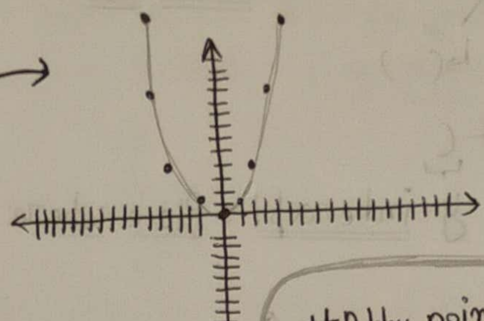
Parabola: Graph with equations like $y=x^2$, $y=-x^2$, $x=y^2$, $x=-y^2$, $y=\sqrt{x}$, $x=\sqrt{y}$ ⇒ (Quadratic & Underoot wali eq)

• Draw ⤵

$y = x^2$

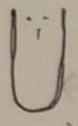
x	0	1	2	3	4	-1
y	0	1	4	9	16	1

.... →



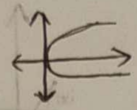
Quadratic equation

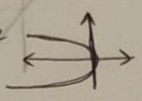
Trick: y → U

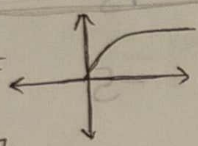
$y = x^2$ = 

opposite eat C

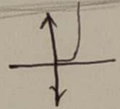
$y = -x^2$ = 

$x = y^2$ 

$x = -y^2$ 

$y = \sqrt{x}$ = 

root mean cover

$x = \sqrt{y}$ 

{Root never negative}

Pubby point

• $y = mx + c$ (m → slope, c → y) └→ Butterfly + or − than tan θ

• $m = \frac{y_2 - y_1}{x_2 - x_1}$

• for x and y {x ⇒ y = 0}, {y ⇒ x = 0}

• Parabola → opposite and cover → root → + → Cover only

L8 ⇒ GP [Geometric Progresstion]

⇒ 1, 5, 25, 125, 625 .... G.P (Geometric Progresstion)

⇒ 1, 10, 11, 100, 101 --- (only 1's & 0's)

{ ⇒ a = first term
⇒ r = Common Ratio }

* Eg. 8, 16, 32, 64 .....
 • a = 8
 • r = 2

⇒ $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}$ ....
 • a = 1
 • $r = \frac{1}{2}$

⇒ $1, \frac{-1}{2}, +\frac{1}{4}, -\frac{1}{8}$ ....
 • a = 1
 • $r = -\frac{1}{2}$

] When start from 1 So, a = 1, $r = \pm 2$

⇒ $\frac{GM}{r^2}, \frac{GM}{4r^2}, \frac{GM}{16r^2}$ --- $a = \frac{GM}{r^2}$ | $r = \frac{1}{4}$

⇒ General formate of G.P.

⇒ a, ar, ar^2, ar^3, ar^4 .... $\{ar^{(n-1)}\}$

⇒ S_n of n^{th} terms ⇒ $a+ar+ar^2+ar^3\ldots\ldots$

⇒ $S_n = \frac{a(r^n-1)}{r-1} = \frac{a(1-r^n)}{(1-r)}$

* a^∞ = $2^\infty = \infty$ [a>1]; $\frac{1}{2}^\infty = 0$ [a<1]; [a=1] = Not Define } a=r (common difference)

2 Find value of ⇒ 1+2+4+8+16+32+64+128=??

a=1 r=2

$S_{n8} = a\left(\frac{r^n-1}{r-1}\right)$

$= 1\left(\frac{2^8-1}{2-1}\right)$

$= 1\left(\frac{256-1}{1}\right)$

⇒ 255 Ans

⇒ 1+3+9+27+81+..... 10 terms =

a=1 r=3

ar^9 ⇒ 1×3^9

10^{th} ⇒ 3^9

⇒ 19,683

$S_{n10} = 1\left(\frac{3^{10}-1}{3-1}\right)$

$= 1\left(\frac{59049-1}{2}\right)$

$= \frac{59048}{2} = 29524$ Ans

⇒ $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}$..... 10 terms

a=1 $r=\frac{1}{2}=0$

$S_{n10} = 1\left(\frac{1}{2}-1\right)X$ ⇒ $a\left(\frac{1-r^n}{1-r}\right)$ → r<1

⇒ $1\left(\frac{1-\left(\frac{1}{2}\right)^{10}}{\frac{1}{2}-\frac{1}{2}}\right)$ ⇒ $1\left(\frac{1-\frac{1}{1024}}{\frac{1}{2}}\right)$

$= \frac{1023}{1024} \times \frac{2}{1} = \frac{1023}{512}$ Ans

⇒ $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}\ldots\ldots\infty$

• a=1 • $r=\frac{1}{2}$ • $n^{th}=\infty$

⇒ $1\left(\frac{1-\left(\frac{1}{2}\right)^\infty}{1-\frac{1}{2}}\right)$ ⇒ $1\left(\frac{1-(0)}{\frac{1}{2}}\right)$ → So, $(r<1)^\infty$ So, $= \left(\frac{1}{1-r}\right)$ Formula

⇒ $\frac{1}{\frac{1}{2}}$ ⇒ 2 Ans

#L9 G.P then A.P (Arithmetic Progression)

⇒ 2, 5, 8, 11, 14. . . . .

a , d = $a^2 - a^1$

↓ d = 3 → Common difference

First term

⇒ a, a+d, a+2d . . . $\{a+(n-1)d = a_{nth} = l$ ← Last term $\}$

$S_n = a_1 + a_2 + a_3 + a_4 \ldots$

$= a + a + d + a + 2d$

$= (a + a + a + \ldots n) + (d + 2d + 3d \ldots \ldots (n-1)d)$

$= na + d[1 + 2 \ldots \ldots (n-1)]$ — (i)

So, we know that ⇒ $1 + 2 + 3 \ldots \ldots + (n-1) + n = \frac{n(n+1)}{2}$

$1 + 2 + 3 \ldots \ldots + (n-1) = \frac{n(n+1)}{2} - n = \frac{n^2 - n}{2}$

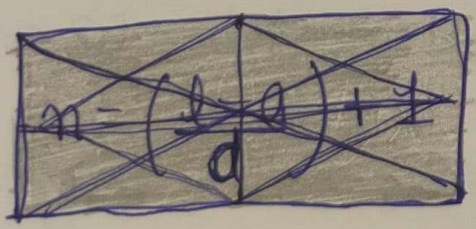
$= \frac{n(n-1)}{2}$ — (ii)

∴ From eq (i) and (ii)

$\Rightarrow \left[S_n = \frac{n}{2}\{2a + (n-1)d\}\right]$

or

$\left[S_n = \frac{n}{2}\{a + l\}\right]$



[⇒ Sum of number n

• $1 + 2 + 3 + 4 \ldots \ldots + n = \frac{n(n+1)}{2}$]

[⇒ Sum of n odd number

• $1 + 3 + 5 \ldots \ldots + n = n^2$]

↳ $1 + 3 = 4 = 2^2$

$1 + 3 + 5 = 9 = 3^2$

So, $1 + 3 + 5 \ldots n = (n)^2$

⇒ $S_n = \frac{n}{2}\{2a + (n-1)d\}$

$= \frac{n}{2}\{2 + (n-1)\}$

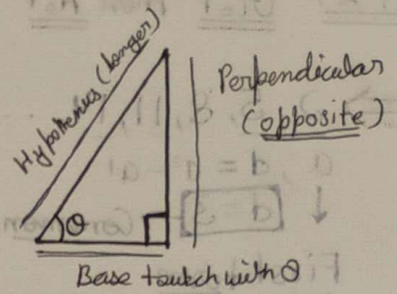
$= \frac{n}{2}\{2 - 1 + n\}$

$= \frac{n(n+1)}{2}$

Neet Level Maths

⇒ Trigonometry

⇒

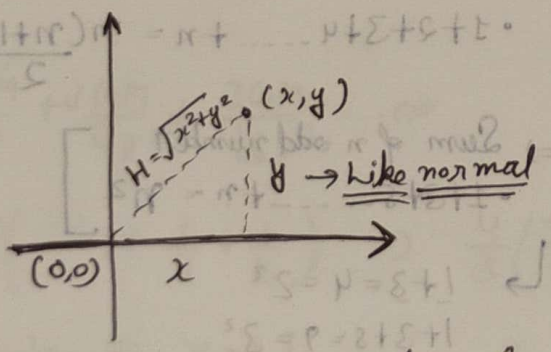


⇒ Sin ⇒ $\frac{P}{H}$ Cosec ⇒ $\frac{H}{P}$

⇒ Cos ⇒ $\frac{B}{H}$ Sec ⇒ $\frac{H}{B}$

⇒ tan ⇒ $\frac{P}{B}$ Cot ⇒ $\frac{B}{P}$

	0°	30°	45°	60°	90°	120°	135°	150°	180°	37°	53°
Sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1						
Cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0						
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	N.D						



Trigo in 4 quadrants

(I)

⇒ P=y , B=x , H=$\sqrt{x^2+y^2}$

- Sin = $\frac{P}{H} = \frac{y}{H} = \frac{+}{+}$ = +Ve
- Cos θ = $\frac{B}{H} = \frac{x}{H} = \frac{+}{+}$ = +Ve
- tan θ = $\frac{P(y)}{B(x)} = \frac{+}{+}$ = +Ve

(II)

- Sin = $\frac{P}{H} = \frac{y}{H}$ = +Ve
- Cos = $\frac{B}{H} = \frac{x}{H}$ = −Ve
- tan θ = $\frac{P}{B} = \frac{P(y)}{B(x)} = \frac{+}{-}$ = −Ve

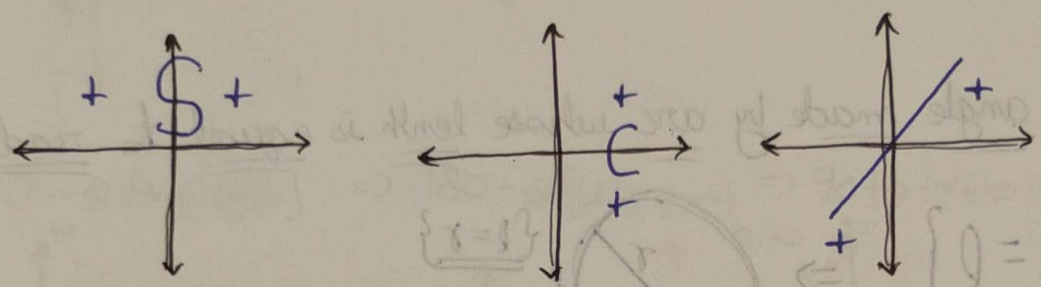
III

- $\sin\theta = \frac{P}{H} = \frac{y}{H} = \frac{-}{+} = -Ve$
- $\cos\theta = \frac{B}{H} = \frac{x}{H} = \frac{-}{+} = -Ve$
- $\tan\theta = \frac{P}{B} = \frac{y}{x} = \frac{+}{+} = +Ve$

IV

- $\sin\theta = \frac{P}{H} = \frac{y}{H} = \frac{-}{+} = -Ve$
- $\cos\theta = \frac{B}{H} = \frac{x}{H} = \frac{+}{+} = +Ve$
- $\tan\theta = \frac{P}{B} = \frac{y}{x} = \frac{-}{+} = -Ve$

Sin Cos tan



$\star$

$\Rightarrow \sin\theta = \frac{y}{\sqrt{x^2+y^2}} = \frac{y}{H}$

$\Rightarrow \cos\theta = \frac{x}{\sqrt{x^2+y^2}} = \frac{x}{H}$

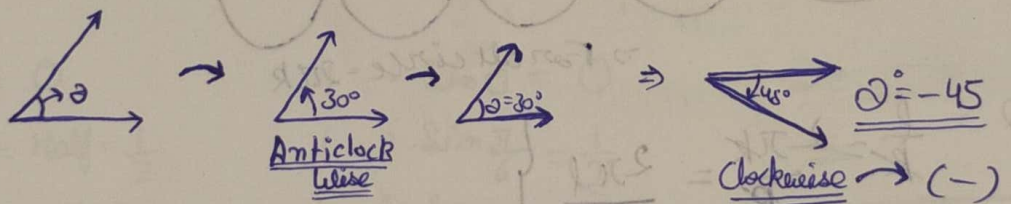
$\Rightarrow \tan\theta = \frac{y}{x} = \frac{y}{x}$

or

A	S	T	C
↓	↓	↓	↓
aao (all)	Sub (Sin)	tolne (tan)	chale (Cos)

+

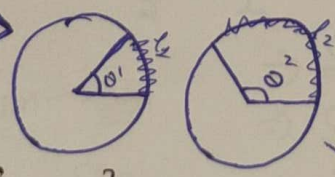
#L10 Angle:-



#Bye-Bye Digree:-

$\Rightarrow$ S.I unit of Angle = Radian

$\Rightarrow$ {Angle $\propto$ Lenth of Arc}

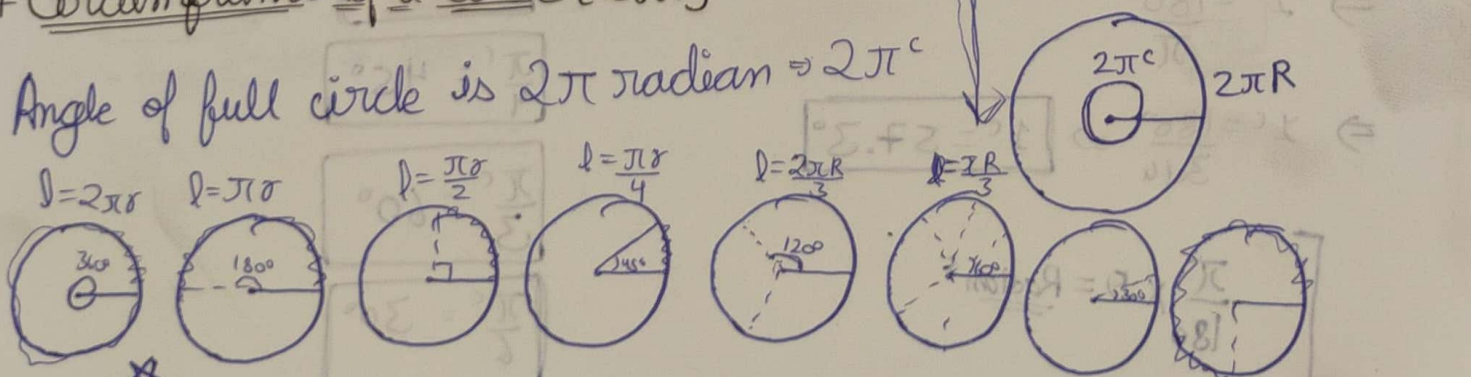


$\Rightarrow \theta^2 > \theta^1$

$\Rightarrow l^2 > l^1$

#Circumfrance of a circle $\{2\pi r\}$

Angle of full circle is 2π radian $\Rightarrow 2\pi^c$



$\star$

$\Rightarrow \left[\theta^c = \frac{l}{R}\right]$

$l = \frac{\pi R}{6}$ $\quad l = \frac{3}{4}(2\pi R) = \frac{3}{2}\pi R$

*For Radian, Radius ko mar do

⇒ $360° = 2\pi R = 2\pi^c$

⇒ $180° = \pi R = \pi^c$

⇒ $270° = \frac{2\pi R}{3} = \frac{2\pi^c}{3}$

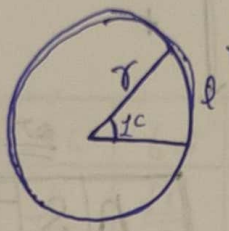
⇒ { $\frac{2\pi R}{x \to 90}$ se divide }

Except = 360°

#1 Radian

⇒ 1^c is the angle made by arc whose lenth is equal to radius.

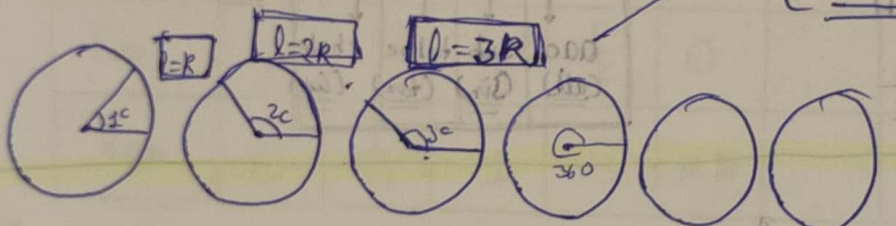
* $1^c = \{R = l\}$ ⇒



$\{l = r\}$

$\{R = l\} = 0^c$

⇒



⇒ For all circle = $2\pi R$

$\left\{2 = \frac{l}{R} = \frac{2\pi R}{R} = \frac{2\pi l}{r}\right\}$

⇒ $360 = 2\pi c$

⇒ $2\pi^c = 360$

* ⇒ $\pi c = 180°$

⇒ $3\pi c \Rightarrow 3(\pi^c) \Rightarrow 3(180) = 540°$

⇒ $\pi^c = \frac{180°}{1}$

⇒ $1^c = \frac{180°}{\pi}$

⇒ $1^c = \frac{180°}{3.14} \Rightarrow \boxed{1^c = 57.3°}$

$\left[\frac{\pi}{180} \times D = \text{Radian}^c\right]$

$\boxed{\pi^c = 180°}$

$\boxed{\frac{\pi}{2}^c = 90°}$

$\boxed{\frac{\pi}{4}^c = 45°}$

$\boxed{\frac{\pi^c}{3} = 60°}$

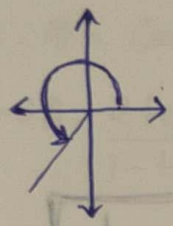
$\boxed{\frac{\pi^c}{6} = 30°}$

$\left[\frac{1}{\pi} = {}^c\theta\right]$

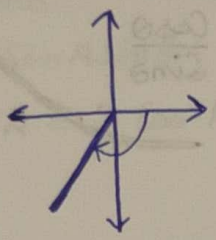
#Quadrants

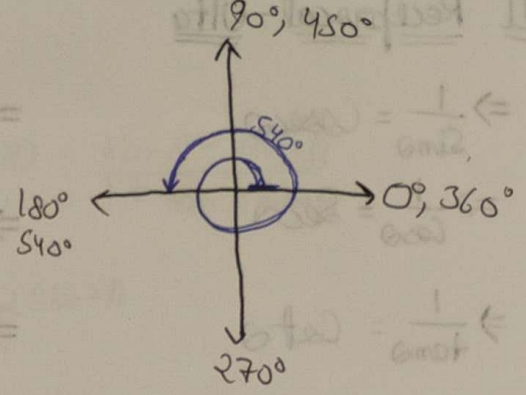
$\theta = 247°$

$= 180° + 67°$

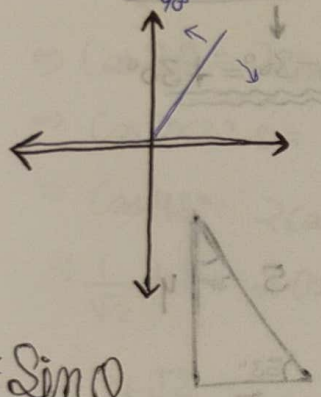


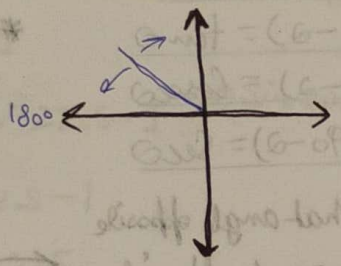
$\theta = -120°$

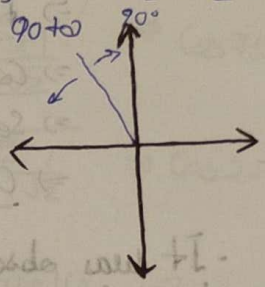


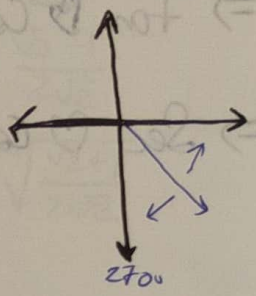


$\Rightarrow 90 - \theta$ {90 se chaata} $\Rightarrow 180 - \theta$ {180° se chaata} $\Rightarrow 90 + \theta$ {90° se bara} $\Rightarrow 270 + \theta$ {270° se bara}









*Sinθ

- $\sin 0° = 0$
- $\sin 30° = \text{Half} = \frac{1}{2}$
- $\sin 45° = \text{Half}\sqrt{2} = \frac{1}{\sqrt{2}}$
- $\sin 60° = \text{Half}\sqrt{3} = \frac{\sqrt{3}}{2}$
- $\sin 90° = 1$

- $\sin 0 = 0$
- $\sin \frac{\pi}{6} = \frac{1}{2}$
- $\sin \frac{\pi}{4} = \frac{1}{\sqrt{2}}$
- $\sin \frac{\pi}{3} = \frac{\sqrt{3}}{2}$
- $\sin \frac{\pi}{2} = 1$

➡ For positive or negative see ASTC

$\Rightarrow 90° \& 270° \Rightarrow$ opposite $\sin \rightarrow \cos$

$\Rightarrow 180° \& 360° \Rightarrow$ Same $\sin \rightarrow \sin$

- form a table So, Same

$\Rightarrow \sin(60° + 45°) = X$

$\Rightarrow \sin(90° + 45°) = \checkmark$

$\Rightarrow \sin(90° + 45°) = +\cos 45°$

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

#L11 Reciprocal - Ulta

$\Rightarrow \frac{1}{\sin\theta} = \operatorname{cosec}\theta$

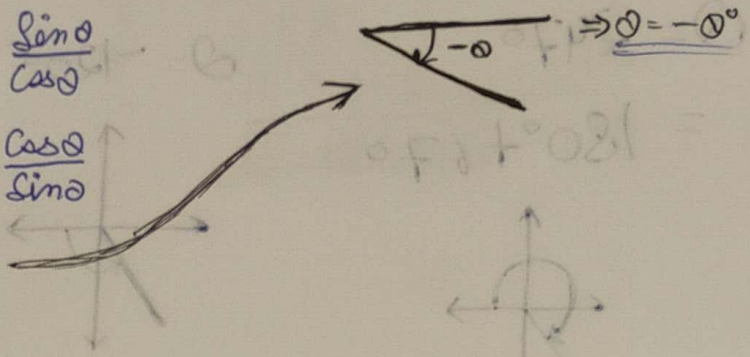
$\Rightarrow \frac{1}{\cos\theta} = \sec\theta$

$\Rightarrow \frac{1}{\tan\theta} = \cot\theta$

$\Rightarrow \tan\theta = \frac{\sin\theta}{\cos\theta}$

$\Rightarrow \cot\theta = \frac{\cos\theta}{\sin\theta}$

$\Rightarrow -\theta \Rightarrow$



$\Rightarrow \theta = -\theta°$

#Complimentary angle

$\Rightarrow$ Sin ♉ Cos

$\Rightarrow$ tan ♊ Cot

$\Rightarrow$ Sec ♌ Cosec

$\Rightarrow \sin(90-\theta) = \cos\theta$

$\Rightarrow \cos(90-\theta) = \sin\theta$

$\Rightarrow \tan(90-\theta) = \cot\theta$

$\Rightarrow \cot(90-\theta) = \tan\theta$

$\Rightarrow \sec(90-\theta) = \operatorname{cosec}\theta$

$\Rightarrow \operatorname{cosec}(90-\theta) = \sec\theta$

Cos = +]
Sec = +] - Degree

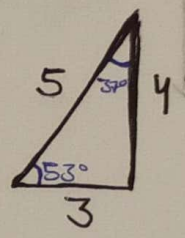
$\downarrow$

$* \cos -30° = +30°$

- It was observe that angle opposite to 3 is 37° and angle opposite to 4 is 53°.

{3 opposite = 37°}

{4 opposite = 53°}



$\Rightarrow \sin 37° = \frac{3}{5}$ $\Rightarrow \cos 37° = \frac{4}{5}$ $\Rightarrow \tan 37° = \frac{3}{4}$

$\Rightarrow \sin 53° = \frac{4}{5}$ $\Rightarrow \cos 53° = \frac{3}{5}$ $\Rightarrow \tan 53° = \frac{4}{3}$

$\Rightarrow \sin^2\theta + \cos^2\theta = 1$

$\Rightarrow \cot^2\theta - \operatorname{cosec}^2\theta = 1$

$\Rightarrow \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow \sin(A+B) = \sin A\cos B + \cos A \sin B$

$\Rightarrow \sin(A-B) = \sin A\cos B - \cos A \sin B$

$\Rightarrow \sin 2A = 2\sin A \cos A$

Q:- $\sin 75° = \sin(45° - 30°) = \sin 45°\cos 30° - \cos 45°\sin 30°$

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

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

$\Rightarrow \cos(A+B) = \cos A\cos B - \sin A\sin B$

$\Rightarrow \tan(A+B) = \dfrac{\tan A + \tan B}{1 - \tan A\tan B}$ $\quad \Rightarrow \tan(A-B) = \dfrac{\tan A - \tan B}{1 + \tan A\tan B}$

$\Rightarrow \cos(A-B) = \cos A\cos B + \sin A\sin B$

$\Rightarrow \cos(2A) = \cos^2 A - \sin^2 A = 2\cos^2 A - 1 = 1 - 2\sin^2 A$

$\Rightarrow \tan 2A = \dfrac{2\tan A}{1 - \tan^2 A}$

2. $\cos 22.5$

$\Rightarrow \cos 2A = 2\cos^2 A - 1$

$\Rightarrow \cos 2\times 22.5 = 2\cos^2 22.5 - 1$

$\Rightarrow \cos 45^\circ = 2\cos^2 22.5 - 1$

$\Rightarrow \dfrac{1}{\sqrt{2}} + 1 = 2\cos^2 22.5$

$\Rightarrow \dfrac{1+\sqrt{2}}{\sqrt{2}} = 2\cos^2 22.5$

$\Rightarrow \dfrac{1+\sqrt{2}}{2\sqrt{2}} = \cos^2 22.5$

$\Rightarrow \sin 15^\circ = \dfrac{\sqrt{3}-1}{2\sqrt{2}}$ $\quad \Rightarrow \cos 15^\circ = \dfrac{\sqrt{3}+1}{2\sqrt{2}}$

$\Rightarrow \sin 75^\circ = \dfrac{\sqrt{3}+1}{2\sqrt{2}}$ $\quad \Rightarrow \cos 75^\circ = \dfrac{\sqrt{3}-1}{2\sqrt{2}}$

$\Rightarrow \sin 22.5^\circ = \sqrt{\dfrac{\sqrt{2}-1}{2\sqrt{2}}}$ $\quad \Rightarrow \cos 22.5^\circ = \sqrt{\dfrac{\sqrt{2}+1}{2\sqrt{2}}}$

$\Rightarrow \tan 15^\circ = 2 - \sqrt{3}$

$\Rightarrow \tan 75^\circ = 2 + \sqrt{3}$

$\Rightarrow \tan 22.5^\circ = \sqrt{2} - 1$

H.W

#L12 $\Rightarrow$ (A+B) Identies $\Rightarrow$ $\sin 15^\circ = \sin(45^\circ - 30^\circ) = \sin 45^\circ\cos 30^\circ - \cos 45^\circ \sin 30^\circ$

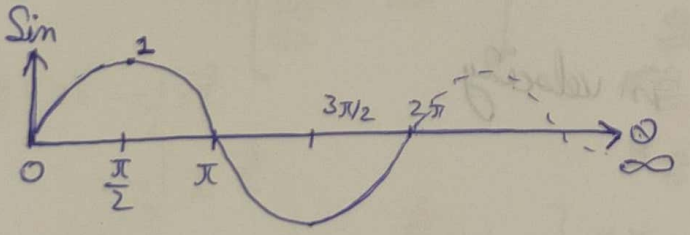
$= \dfrac{1}{\sqrt{2}}\left(\dfrac{\sqrt{3}}{2}\right) - \left(\dfrac{1}{\sqrt{2}}\right)\left(\dfrac{1}{2}\right)$

$= \dfrac{\sqrt{3}}{2\sqrt{2}} - \dfrac{1}{2\sqrt{2}}$

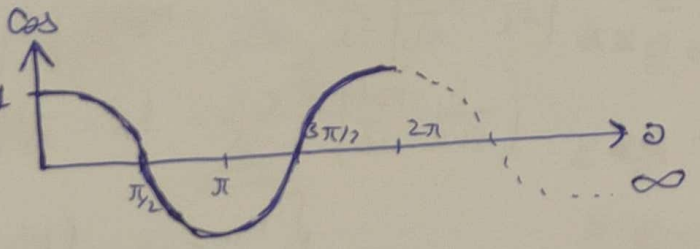
$= \dfrac{\sqrt{3}-1}{2\sqrt{2}}$

Graph & Small Angle

$\Rightarrow$



$\Rightarrow$



Small Angle Approximation

⇒ This valid only for very small Angles.

θ is very small :-

① $\sin\theta = \tan\theta = \theta$

② $\cos\theta = 1$

} ✱ In Radian

⇒ $\left[\frac{\pi^c}{180^\circ} \times 1^\circ\right]$ → If in Degree change into Radian.

#L13 Calculus :- Change = Δ = Final - Initial

※ $v = 10\,m/s \rightarrow v = 5\,m/s$ ⇒ $\Delta\vec{v} = 5 - 10 = -5\,m/s$

✱ Difference = (Bada - Chota)

※ $v = 10\,m/s \rightarrow v = 5\,m/s$ {Difference in $v = 10 - 5 = 5\,m/s$}

✱ Increase by 5 times | Increase to

$\vec{v} = 10 + 5 \times 10 = 60$ | $v = 10$ Increase to 5 times

$v = 10 \times 5 = 50\,m/s$

✱ [⇒ d → bahut chotu sa change]

※ Δx → change in displacement.

dx → bahut chotu sa change in displacement

Δv → change in velocity

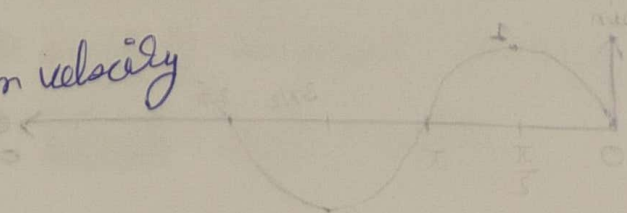
dv → bahut chota sa change in velocity

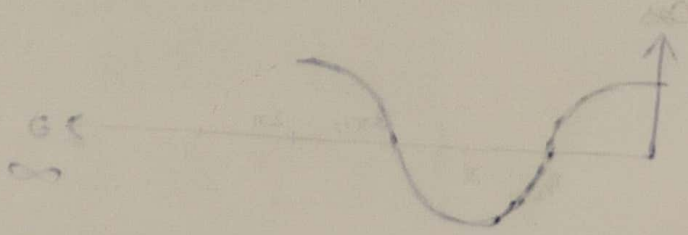
$\Delta\theta$ → change in angle

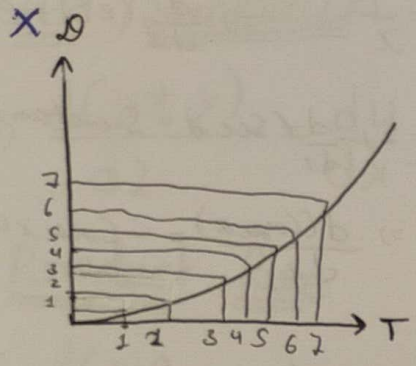
$d\theta$ →

Δt → change in time

dt →







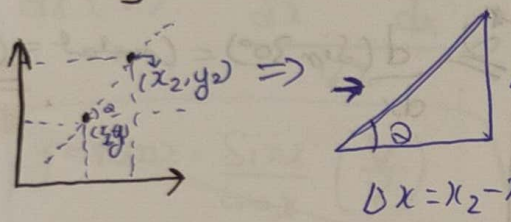
$u = \text{Speed} = \frac{D}{T} = \frac{\Delta x}{\Delta t}$

$\Rightarrow$ At 3sec = $x = 3$

$\Rightarrow$ At 6Sec = $x = 6$

So $\frac{\text{Distance (Bw)}}{\text{Time}} = \frac{6-3}{6-3} = \frac{3}{3} = 1$ Speed

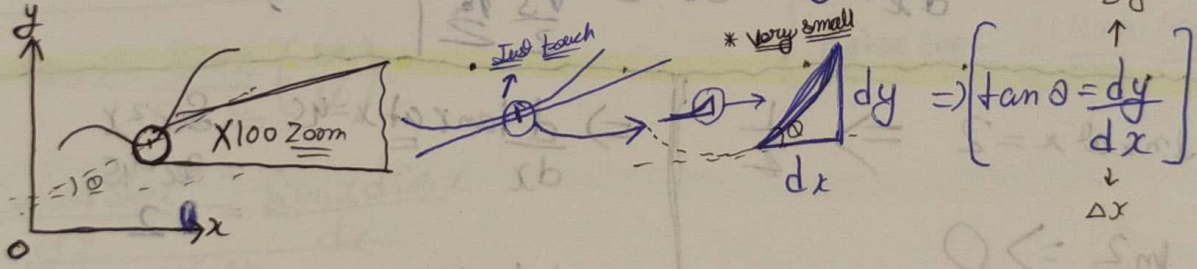
$\Rightarrow \tan\theta = \frac{P}{B}$



$\rightarrow \tan\theta = \frac{P}{B} = \frac{\Delta y}{\Delta x}$

$\Rightarrow$ Diffrentiation

$\Rightarrow$ It is used to calculate slope of graph at any point.



$\Rightarrow \left[\tan\theta = \frac{dy}{dx}\right]$

Formula ① $y = x^n$

$\Rightarrow$ Differentiation of y w.r.t x

$\Rightarrow \left[\frac{dy}{dx} = nx^{n-1}\right]$

$\Rightarrow y = x^{10} = \frac{dy}{dx} = 10x^9$

$\Rightarrow y = x^{123} = \frac{dy}{dx} = 123x^{122}$

$\Rightarrow y = x^3 = \frac{dy}{dx} = 3x^2$

$\Rightarrow y = x^2 = \frac{dy}{dx} = 2x$

$\Rightarrow y = x = 1$

$\Rightarrow y = 5x^3 = 5 \times 3x^2 = 15x^2$

$\Rightarrow y = 5x = 5$

$\Rightarrow y = x^{-5} = -5x^{-5-1} \Rightarrow -5x^{-6}$

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

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

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

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

$\left\{\frac{d(y)}{dx} = nx^{n-1}\right\}$

$\Rightarrow \frac{d(\text{constant})}{dx} = \text{constant} \times 0 = 0$ $\quad \Rightarrow \frac{d}{dx}(\ln x) = \frac{1}{x}$ $\quad \Rightarrow \frac{d}{dx}(e^x) = e^x$

$\Rightarrow \frac{d(\sin x)}{dx} = \cos x$ $\quad \Rightarrow \frac{d}{dx}(\tan x) = \sec^2 x$ $\quad \Rightarrow \frac{d}{dx}(\sec x) = \sec x \tan x$

$\Rightarrow \frac{d(\cos x)}{dx} = -\sin x$ $\quad \Rightarrow \frac{d}{dx}(\cot x) = -\operatorname{cosec}^2 x$ $\quad \Rightarrow \frac{d(\operatorname{cosec} x)}{dx} = -\operatorname{cosec} x \cot x$

Q19:- $y = \sin x + \cos x$

$\Rightarrow \cos x - \sin x$

Q:- Find value of $\frac{dy}{dx}$ of $\sin x$ @ $x = 30°$

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

$x = 30°$ (given)

$\frac{dy}{dx} = \cos 30° = \frac{\sqrt{3}}{2}$

Q2 $\frac{d(\sin 30°)}{dx} = \text{constant} = 0$

#L14

$\Rightarrow \frac{d}{dx} \ln x \text{ at } x = 2 \Rightarrow \frac{1}{2}$

$\Rightarrow \frac{d}{dx} \ln 2 \Rightarrow 0$

$\Rightarrow \frac{de^x}{dx} \text{ at } x = 3 \Rightarrow e^3$

$\Rightarrow \frac{de^3}{dx} \Rightarrow 0$

$\Rightarrow \frac{d(44)}{dx} \Rightarrow 0$

$\Rightarrow \frac{d}{dx} \tan x \text{ at } x = 45 = \sec^2 x = \sec^2 45 = (\sqrt{2})^2 = 2$

$\Rightarrow \frac{d}{dx} \tan 45° = 0$

{at = baad me}

$\Rightarrow \frac{d(x^4)}{dx} \Rightarrow$ at $x\ 4 = 4x^3 = 4(4)^3 = 4 \times 64 = 256$

Add / Subtract

$$\Rightarrow \frac{d(u \pm v)}{dx} = \frac{du}{dx} \pm \frac{dv}{dx}$$

$y = x^3 + x^7$

$\Rightarrow \frac{dy}{dx} = 3x^2 + 7x^6$

$y = x^4 - x^2$

$\Rightarrow \frac{dy}{dx} = 4x^3 - 2x$

Product Rule

$$\Rightarrow \frac{d(uv)}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$$

$y = x \sin x$

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

$y = xe^x \tan = xe^x \tan$ {one by one}

$\Rightarrow xe^x \frac{d\tan x}{dx} + x\tan x \frac{de^x}{dx} + e^x \tan x \frac{dx}{dx}$

$\Rightarrow xe^x \sec^2 + x\tan x e^x + e^x \tan^x$

* No any change

* No change

$\Rightarrow$ {Didi Sakka Kategi}

Division Rule

$$\Rightarrow \frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$$

$y = \tan x = \frac{\sin x}{\cos x}\left(\frac{u}{v}\right)$

$\frac{\sin x\, d\cos x}{dx} - \frac{\cos x\, d\sin x}{dx}$ over $\cos x^2$

$\Rightarrow \sin - \sin x \div \cos x + \cos x$

$\Rightarrow y = \tan x = \frac{\sin x}{\cos x}\left(\frac{u}{v}\right)$

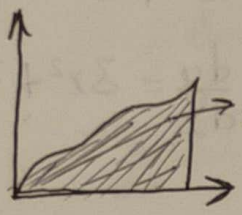
{Ratse same 2 Kahi/Kate!}

$= \frac{\cos x\, d\sin x}{dx} - \frac{\sin x\, d\cos x}{dx}$ over $\cos^2 x$

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

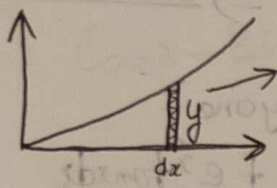
$\Rightarrow \frac{\cos^2 x + \sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x} = \sec^2 x$

Integration ⇒ It is used to calculate Area under the curve.



⇒ Formula → Opposite of Differentiation

⇒ Integration ⇒ $\int$ = Add kare like Sigma but because of Not factal triangle we use this sigh.



Area (chotu) ⇒ ydx

So, Add = total = $\left[\int ydx\right]$

$\Rightarrow \left[\int x^n dx = \frac{x^{n+1}}{n+1}\right]$

$\Rightarrow \int dx = \boxed{x}$

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

$\Rightarrow \int \frac{1}{\sqrt{x}} dx = 2\sqrt{x}$

$\Rightarrow \int e^x dx = e^x$

$\Rightarrow \int \frac{1}{x} dx = \ln x$

$\Rightarrow \int \cos x dx = \sin x$

$\Rightarrow \int \sin x dx = -\cos x$

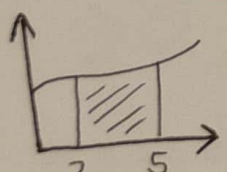
$\Rightarrow \int \sec^2 dx = \tan x$

$\Rightarrow \int \operatorname{cosec}^2 x dx = -\cot x$

$\Rightarrow \int \sec x \tan x dx = \sec x$

$\Rightarrow \int \operatorname{cosec} x \cot x dx = -\operatorname{cosec} x$

L15



$\Rightarrow \int_2^5 f(x)dx$ → upper (Big) ⇒ Area under

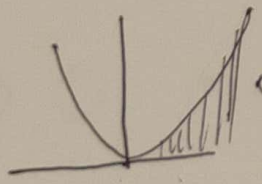
2 → Lower small

$\Rightarrow \int x^n dx = \frac{x^{n+1}}{n+1} + C$ =

$\left[\int x^1 dx = \frac{x^2}{2} + C\right]$ By $\left[\int x^{-1} dx = \frac{1}{x} dx \Rightarrow \frac{1}{x}\right]$

Infinite Integration. → Koi limit nahi hai

$y = x^2$



$\Rightarrow$ Area = $\int y dx = \int x^2 dx = \frac{x^3}{3} + C$

∞

⇒ The Name between 1 − 9 $\int x^{1-9} dx = \boxed{\frac{z}{Y}}$ → find

Same → $\frac{dy}{dx} = x^{1-9}$

Thasuby all Formula of integeration are opposite to differention.

Definite Integration (Limits are given) → $\int_x^y$ (No C used)

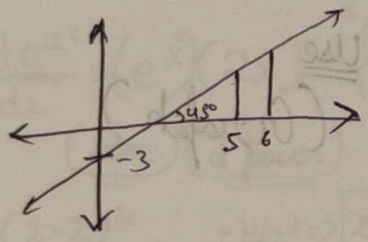
Q. $\int_1^5 x^2 dx = \left[\frac{x^3}{3}\right]_1^5$

$= \frac{5^3}{3} - \frac{1^3}{3} \Rightarrow \frac{125-1}{3} = \frac{124}{3}$ ✓

* $\left\{\frac{2}{\sqrt{2}} = \sqrt{2}\right\}$

Q. $\int_3^{10} 7dx = 7[x]_3^{10} = 7(10-3) = 7 \times 7 = \underline{49}$

Q. $\int_0^3 8x^3 dx = 8\left[\frac{x^4}{4}\right]_0^3 = 2[x^4]_0^3 = 2[3^4 - 0^4] = \underline{162}$ Ans

Q. 

$\Rightarrow y = mx + c$

$\boxed{y = x - 3}$

$\text{Area} = \int_5^6 y dx = \int_5^6 (x-3)dx$

$\Rightarrow \left[\frac{x^2}{2} - 3x\right]_5^6 \Rightarrow \left[\frac{6^2}{2} - 3 \times 6\right] \Rightarrow \underline{2.5}$ Ans

Q. $\int_{30°}^{90°} \sin x dx = [-\cos x]_{30°}^{90°} = (-\cos 90°) - (-\cos 30°)$

$= 0 - (-\sqrt{3}/2) = \boxed{\frac{\sqrt{3}}{2}}$

Q. $\int_0^{\frac{\pi}{2}} \cos x dx = [\sin x]_0^{\frac{\pi}{2}} = [\sin 90°] = \boxed{1}$

* Q. $\int \frac{1}{x} dx = \ln x + C$

Q. $\int_4^8 \frac{1}{x} dx = [\ln x]_4^8 \cdot \ln 8 - \ln 4 = 0.6 - 0.\blacksquare 48 \Rightarrow \ln\left(\frac{8}{4}\right)$

$= 0.12$ X $\Rightarrow \ln 2 = 0.693$

$\Rightarrow \int \frac{1}{x+3}dx = \ln(x+3)+C$

$\Rightarrow \int_1^{55} \frac{1}{x+5}dx = \Big[\ln(x+5)\Big]_1^{55} \Rightarrow \ln(60) - \ln(6) = \ln\left(\frac{60}{6}\right) = \ln 10 = \underline{2.303}$

$\Rightarrow$ Sin 760° → Pass until Se 90 (Multiply) and Subtract

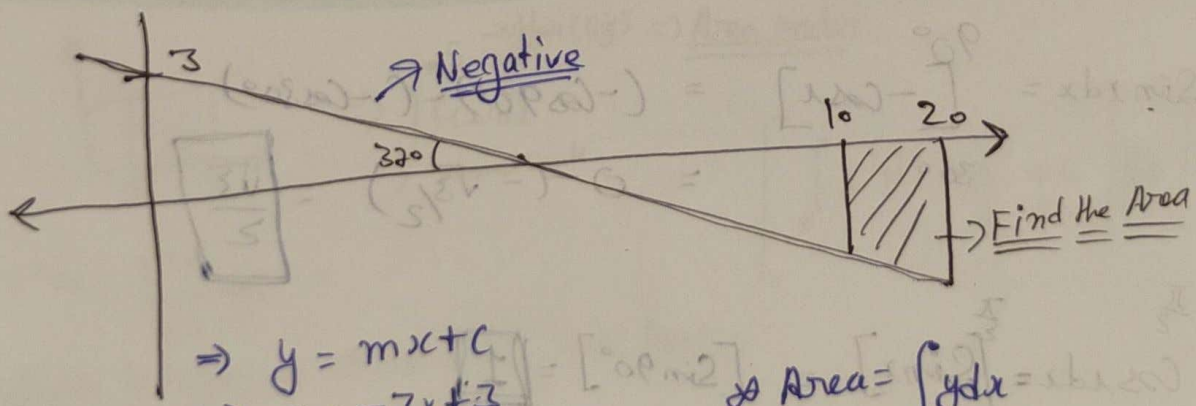
$760 - 720$

Sin 40°

$\Rightarrow \int_0^{90} \sin x\,dx = 1$ $\quad \int_0^{720} \sin x\,dx = \quad \Rightarrow \frac{x}{90^\circ} = \int_0^{1} \sin x\,dx$ Use (Graph)

$\Rightarrow \int_0^{90} \cos x\,dx = 1$ $\quad \int_0^{180} \cos x\,dx = 0$ Use (Graph)

Q



$\Rightarrow y = mx+C$

$\Rightarrow m = -\frac{3}{4}x + 3$

$\Rightarrow$ Area $= \int y\,dx$

$\Rightarrow \int_{10}^{20} \left(-\frac{3x^2}{4\times 2} + 3x\right)dx$

$\Rightarrow -\frac{3x^2}{8} + 3x_{20}$

$\Rightarrow \left(\frac{-3\times 20\times 20}{8} + 60\right) - \left(\frac{-3\times 10\times 10}{8} + 30\right)$

$\Rightarrow -90 - (-7.5)$

$= -82.5$ (Area negative) ✓

$\Rightarrow \frac{d\,Sin y}{dy} = cos y$ ✓

∘ Ulta pulta

$\Rightarrow \frac{d\,Sin x}{d\theta} = X$ ✱ But $\Rightarrow \frac{d\,Sin x}{d\theta} = Cos x \cdot \frac{dx}{d\theta}$ { Multiply Extra term }

Δ Prove :- $\frac{d(Sin\theta)}{dx} \times \frac{d\theta}{d\theta} \Rightarrow \frac{d(Sin\theta)}{d\theta} \cdot \frac{d\theta}{dx} \Rightarrow \left\{ \frac{d(Sin\theta)}{dx} = Cos\,\theta \cdot \frac{d\theta}{dx} \right\}$

Q. $\frac{d(x^2+2x-3)}{dy} \times \frac{dx}{dx} \Rightarrow \frac{d(x^2+2x-3)}{dx} \times \frac{dx}{dy}$

$\Rightarrow \left[2x+2 \times \frac{dx}{dy} \right]$ Ans

$(x^n + y^n + z^n)$ → also (b)

✱ $\Rightarrow \frac{d(Sin\,x^n)}{dx} = \left(\frac{d\,Sin(x^n)}{dx}\right)(x^n)$ ✱ { Multiply }

✱ $\left\{ e^{\frac{Sin}{2}\frac{ln}{3}\frac{(x^2+4x+9x)}{4}} \right\}$ (Brake So, whole)

✱ $\Rightarrow \frac{de^{x^2}}{dx} = (e^{x^2})(2x)$ { e = Power also }

(Same) (d power)

✱ Q $\Rightarrow \frac{d(x-2)^{10}}{dx} \Rightarrow$ • Hint $\Rightarrow$ $x-2=t$

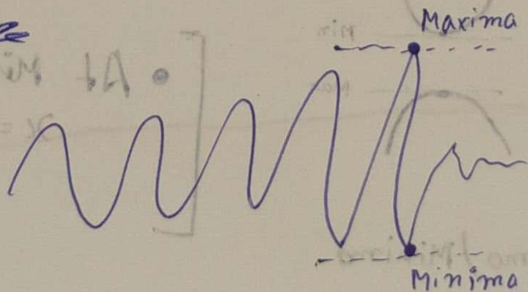
$\Rightarrow \frac{dt^{10}}{dx} = 10t^9 \cdot \frac{dt}{dx}$

$\Rightarrow 10(x-2)^9$ Ans

✱ $\Rightarrow$ { Slope $= \frac{dy}{dx} = tan =$ inclination }

Maxima & Minima

Maxima ↓ Hill point; Minima ↓ Vally point



$\Rightarrow$ Slope at Maxima & Minama = 0

$\Rightarrow$ Just after Maxima - Slope is Negative

$\Rightarrow$ Just after Minima - Slope is positive

$\Rightarrow$ Trigo function $\Rightarrow$ Sin → Max = 1, Min = -1

$\Rightarrow$ Cos → Max = 1, Min = -1

$\Rightarrow$ tan x cot x → Max → ∞, Min → -∞

$\Rightarrow$ Sec x, Cosec x → any thing but never between (-1 & 1) → B/w X

⇒ Maximum value of ⇒ $y = 7\sin x + 10$ {Max → sin x → 1}

$\Rightarrow 7(1) + 10 = 17$

⇒ Maximum value of $y = \frac{1}{10\sin^2 x + 2}$ {$y \uparrow = \frac{1}{x \downarrow}$} (Minimum use 1)

$y =$ (So we use Maxima)

bcz $x^2 \Rightarrow 1$

(So, we use min = 0)

$\Rightarrow \boxed{y = \frac{1}{2}}$ Ans

$y_{max} = \frac{1}{x_{min}}$

$y_{min} = \frac{1}{x_{max}}$

⇒ $a\sin\theta \pm b\cos\theta$ → Max = $\sqrt{a^2+b^2}$, Min = $-\sqrt{a^2+b^2}$

⇒ $y_{min} = \frac{1}{(m\sin\theta + \cos\theta)_{Max}} \Rightarrow \frac{1}{\sqrt{y^2+1}}$

⇒ Quadratic Equation $y \Rightarrow ax^2 + bx + c = 0$

$x = \frac{-b \pm \sqrt{D}}{2a} = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$a > 0 \Rightarrow$ ∪ Min

$a < 0 \Rightarrow$ ∩ Max

• At Minin/Maxima

$x = \frac{-b}{2a}$ $\quad y = \frac{-D}{4a}$

2. Find Maxima/Minima.

⇒ $y = x^2 + 10x + 3$

$a > 0 \Rightarrow$ ∪ ⇒ Minima

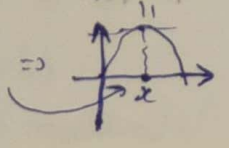
⇒ Minima = $y = \frac{-D}{4a} = \frac{b^2-4ac}{4a} = \frac{(10)^2 - 4\times1\times3}{4\times1} = \frac{100-4\times3}{4} = \frac{100-12}{4}$

$\Rightarrow \frac{-100+12}{4} \Rightarrow \frac{-4(25-3)}{4} = -(22) = -22$ Ans

⇒ $y = -x^2 + 10x + 3$

⇒ $a < 0 \Rightarrow$ ∩ ⇒ Maxima = $\frac{-D}{4a} = \boxed{11}$ Ans

⇒ ∩ ⇒ Maxima

$x = \frac{-b}{2a} \Rightarrow$ 

Prove:- We Know ⇒ Slope = 0 $\left[\frac{dy}{dx}=0\right]$ (Not Important)

$y = ax^2+bx+c$ -(i)

$\frac{dy}{dx} = 2ax+b=0$

$= 2ax+b=0$

$= 2ax=-b$

$\therefore \boxed{x=\frac{-b}{2a}}$ -(ii)

→ Put value of (ii) in (i)

$\Rightarrow y = ax^2+bx+c$

$\Rightarrow y = a\left(\frac{-b}{2a}\right)^2+b\left(\frac{-b}{2a}\right)+c$

$\Rightarrow \frac{ab^2}{4a^2}-\frac{b^2}{2a}+c$

$\Rightarrow \frac{b^2-2b^2+4ac}{4a}$

$\Rightarrow \frac{-b^2+4ac}{4a}$

$y_{m/m} \Rightarrow -\frac{(b^2-4ac)}{4a}$

$\boxed{y_{m/m} = \frac{-D}{4a}}$

Double Differentiation (2 Bar $\frac{dx}{dy}$)

$\Rightarrow y = x^3+4x^2+3x+7$

$y' = \frac{dy}{dx} = 3x^2+8x+3$

$y'' = \frac{d^2y}{dx^2} = 6x+8$ Ans

$\frac{d^2y}{dx^2} \rightarrow \frac{d}{dx}\left(\frac{dy}{dx}\right)$

2. $y = \ln x$

$y' = \frac{dy}{dx} = \frac{1}{x}$

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

#L1

* Mathmatical tools *

#Common Kidnapping

$\Rightarrow 30\times2+30 = 30(2+1) = 30(3) = 90$

$\Rightarrow 188\times9+66\times3 = 9(188+22) =$ (÷3, ×3)

$\Rightarrow (10^2+70^2) = 10^{②}(1^{②}+7^{②}) = 100(50) = 5000$ → out then common

$\Rightarrow X = R\sqrt{3}$ ↓

$\Rightarrow \sqrt{(x^2+R^2)} = \sqrt{(R\sqrt{3})^2+R^2} = \sqrt{(R\sqrt{3}\times R\sqrt{3})}+R^2 = \sqrt{R^23+R^2} = \sqrt{4R^2} = 2R$ ✗

$= \sqrt{(R\sqrt{3})^2+R^2} = \sqrt{R^23+R^2} = \sqrt{(R^2)(3+1)} = \sqrt{4R^2} = 2R$ ✓

$\Rightarrow \sqrt{(7R^2)} = \sqrt[3]{(x^2+R^3)} = 3\sqrt{7R^3+R^3} = 3\sqrt{8R^3} = 2R$ ✓

$\Rightarrow 3\sqrt{27000} = 3\sqrt{27\times1000} = 3\times10 = 30$ ✓

#LCM

$\Rightarrow (60,40) = 20(3\times2) = 120$

$\Rightarrow (144,60) = 12(12\times5) = 12(60) = 720$

#Fractions to Decimals

$= \frac{1}{2}^{0.5} \quad = \frac{1}{3}^{0.3} \quad = \frac{1}{4}^{0.25}$

So, $\frac{8}{3} = 2$ ← 2 left So, 0.6 $\{2+0.6\} = 2.\overline{66}$

$= \frac{55}{3}^{18.2} = 18+\frac{1}{3} = 18+0.2 = 18.2$

$\neq = \frac{1}{5} =$ Nominate $2\times2^{r} = 0.2$ ← Last digit desimal

$= \frac{33}{5} = 6.6 \quad = \frac{124}{5} \xrightarrow{\times2} 24.8 = \frac{135}{5} = 27$

$\neq = \frac{1}{6} = 0.166666\ldots$

$= \frac{1}{7} = 0.1421$

$= \frac{1}{8} = 0.125$

$= \frac{1}{9} = 0.\overline{111} \quad = \frac{2}{9} = 0.\overline{222} \quad = \frac{3}{9} = 0.\overline{333} \quad = \frac{20^2}{9},2 = 2.\overline{222} \quad = \frac{100}{9}^{11} = 1 \Rightarrow 11.\overline{111}$

#Equivalent Fractions

$= \frac{1}{2} \overset{\times4}{=} \frac{x}{8} = \frac{4}{8}$ (×4)

$= \frac{7}{11} \overset{11}{=} \frac{x}{121} = \frac{77}{121}$ (Same)

$= \frac{3}{7} \overset{9}{=} \frac{x}{63} = \frac{27}{63}$

LCM and Fraction

$\Rightarrow \frac{1}{2} + \frac{3}{4} = \frac{1}{2}\left(1 + \frac{3}{2}\right)$ → Use common for fraction

$\Rightarrow \frac{7}{11} - \frac{2}{121} = \frac{1}{11}\left(7 - \frac{2}{11}\right)$

$= \frac{1}{11}\left(\frac{75}{11}\right) \Rightarrow \frac{75}{121}$

{ This work when denominator divides }

1

$\Rightarrow 1 + \frac{1}{8} = \frac{9}{8}$ → Denominater same (8 ⊞ 1)

$\Rightarrow 1 - \frac{1}{9}) = \frac{8}{9}$

$\Rightarrow 1 \ominus \frac{2}{121}) = \frac{119}{121}$

$\frac{\frac{x}{y}}{\frac{a}{b}}$

$= 2 \frac{1}{\frac{3}{5}}$ (opposite) ÷ or 2 divide $\frac{3}{5}$

$\Rightarrow 2 \times \frac{5}{3}$

Decimals addition, Subtraction Rules (Point se point milao)

$\Rightarrow 0.2 + 0.3 = \frac{0.2}{0.3}$ / 0.5 Ans

$\Rightarrow 0.20 + 0.03 = \frac{0.20}{+0.03}$ / 0.23

$\Rightarrow 8.27 - 1.99 = \frac{8.27}{1.99}$ / 6.28

Decimal Multiply

$\Rightarrow 0.2 \times 0.3 = 0.06$ (1 + 1 = 2)

$\Rightarrow 0.2 \times 0.03 = \frac{0.006}{3}$ (1 + 2 = 3)

$\Rightarrow \frac{0.2}{0.3}$ (If same so (hatao)) $= \frac{2}{3} = 0.\bar{6}$

$\Rightarrow 0.12 \times 0.005 = \frac{12}{100} \times \frac{5}{1000} = \frac{60}{100000} = 0.0006$ (3 → zero; after point 4)

$\Rightarrow \frac{0.3}{0.04} = \frac{3}{0.4} = \frac{30}{4} \times$

$\frac{0.30}{0.04}$ (add) $= \frac{30}{0.4} = \frac{30}{4}$ ✓

$\Rightarrow 99.9 \times 0.5$

$\frac{999}{10} \times \frac{5}{10} = \frac{4995}{100} = 49.95$

$\Rightarrow \frac{6.9}{1.44} = \frac{6.90}{1.44} = \frac{690}{144} \frac{230}{48} = \frac{115}{24}$

⇒ PUPPY POINT-1

- Common Kidnapping $4 + 8 = 4(1+2) = 4 \times 3 = 12$
- LCM = Le common kar multiply $= 6, 9 = 3(2, 3) = 18$
- Equivalent fraction = $\frac{2}{3} \overset{8}{=} \frac{x}{24} = \frac{16}{24}$
- Fraction Addition = $\frac{1}{11} - \frac{8}{99} = \frac{1}{11}\left(1 - \frac{8}{9}\right) = \frac{1}{11}\left(\frac{1}{9}\right) = \frac{1}{99}$
- Fraction Division & Multiplication Rule :- $2 \div \frac{2}{5}$ & $\frac{2}{3} \div 5 \rightarrow 2 \times \frac{5}{2}$ & $\frac{3}{2} \times 5$
- Decimals Addition, Subtraction Rules :- Point se point mila
- Decimals Multiply, Division Rule :-

Point (Gino)

\+

$\frac{x}{10^x}$

Shift Karna