① Coterminal angles — which are same when drawn

Ex : 361°, 1° : Subtracting 360° gives them

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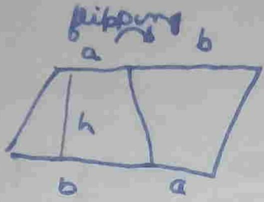
altitudes meet at orthocentre and medians meet at centroid.

If O is orthocentre, $AO = \frac{2}{3} AB$;

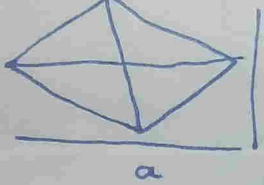
$OB = \frac{1}{3} AB$;

Trapeziod area

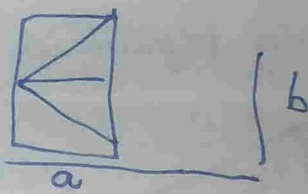


$\therefore \frac{1}{2}(a+b)h = A$

Rhombus area



re-arranging



$\therefore \frac{1}{2}ab = \frac{1}{2}d_1 d_2$

---

ellipses

AB : Semi Major axis   AC : Semi minor axis

2AB : Major axis   2AC : ~~Semi~~ Minor axis

Area can be derived by observing,

from

↓ 18π ↓ 9π

Hence $E_{area} = \frac{1}{2}ab$

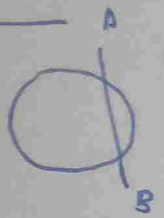
a = semi major axis
b = semi minor axis

Stretching x times the length / width changes area by x times

Cavalier's Principle

2D : If two shapes have same height and matching widths everything along the corresponding height, they have equal area.

3D : If two figures have same height and matching base area everywhere along the corresponding height, they have same volume.



AB is secant, touches only two points

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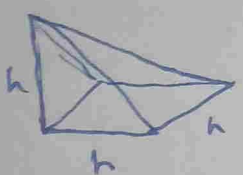
roving pyramid volume,



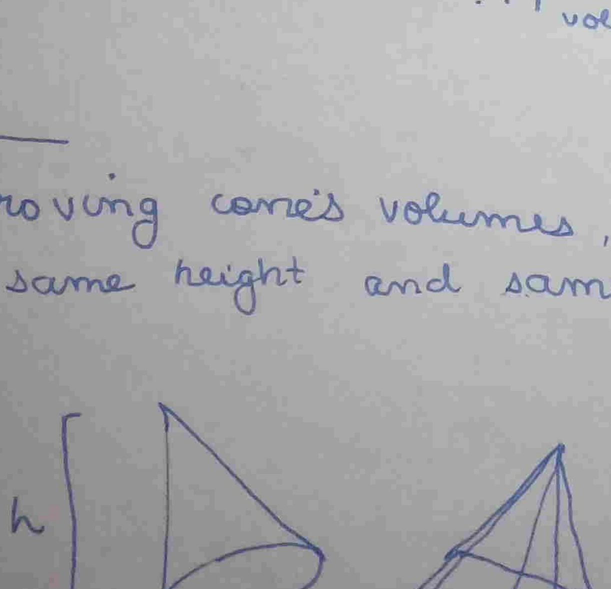
such three can be arranged to form a cube

$\therefore$ 1 pyramid $= \frac{1}{3}$ cuboid

$\therefore P_{volume} = \frac{1}{3} A h$

Proving cone's volumes, constructing a pyramid with same height and same base area

$\therefore C_v = P_v$ Cavelier's Principle



$P_v = \frac{1}{3} h A$

$\therefore C_v = \frac{1}{3} h A$

$= \frac{1}{3} \pi r^2 h$

③ Proving Volume of Sphere

A cone

$V = \frac{1}{3}\pi r^3$

A cylinder

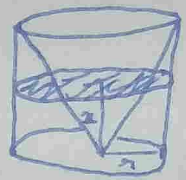
$V = \pi r^3$

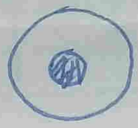
Hence remaining region area $= \frac{2}{3}\pi r^3$

Picking out slices

Hemisphere

Our cylinder, same height and are sliced





Radius $= \sqrt{r^2 - x^2}$

Area $= \pi r^2 - \pi x^2$

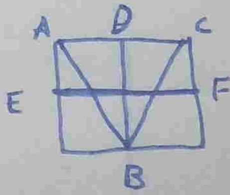
①

→

Outer circle $= \pi r^2$

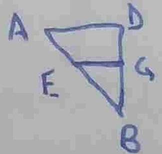
Inner circle :

Since a crossection is like



AD = DB = radius

∴ ADB is right isosceles △



EG is parallel to AD, ∴ Similarity of triangle is there

AD → DB | EG → GB

$r - r$ | $x - x$

Hence

I.C. area $= \pi x^2$

②

∴ Ring $= \pi r^2 - \pi x^2$

①, ② same

∴ By cavalieri's principle

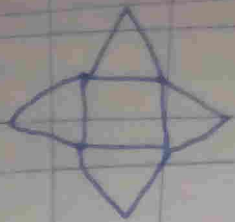
 area is 

$= \frac{2}{3}\pi r^3$ ∴ ① $= \frac{4}{3}\pi r^3$

ADRIN

4

proving pyramid surface area.



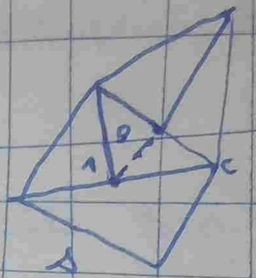
let | be a

| be s

$$\therefore SA = s^2 + 4\left(\tfrac{1}{2}\, b\, h\right)$$

$$= s^2 + 2 s h$$

and

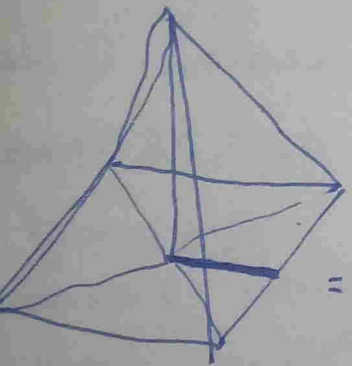


$$AB = \frac{s}{2}$$

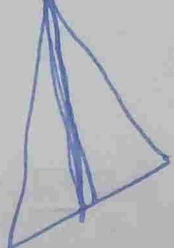
$$AB^2 + \left(\frac{s}{2}\right)^2 = \left(\frac{\sqrt{2}}{2}\right)^2$$

$$AB^2 + \frac{s^2}{4} = \frac{1}{2}$$

proving pyramid surface area



$= \frac{s}{2}$ | $= h$ $\therefore$



$$= \sqrt{\frac{s^2}{4} + h^2}$$

$$= \frac{\sqrt{s^2 + h^2}}{2}$$

$$\therefore T.S.A = s^2 + 4\left(\frac{\sqrt{s^2+h^2}}{2}\right)$$

$$= \boxed{s^2 + 4\sqrt{s^2+h^2}}$$

(5)

...riving cone T.S.A :

circumference : $2\pi r$

slant heigh : s

unrolling

Total area : πs^2

L.S.A fraction : $\frac{2\pi r}{2\pi s}$

of TA $= r/s$

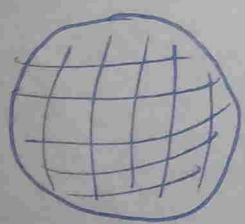
$\therefore$ L.S.A $= \frac{r}{s} \times$ T.A $= \frac{r}{\cancel{s}} \times \pi s^{\cancel{2}}$

$= \pi r s$

Added the base,

T.S.A of cone : $\pi r^2 + \pi r s$

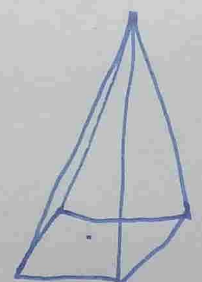
...riving sphere T.S.A.



$V = \frac{4}{3}\pi r^3$

S.A. : A

No. of [pyramid] : N



pyramid base : $\frac{A}{N}$

volume : $\frac{1}{3} \times \frac{A}{N} \times r$

Since sphere is made of N pyram...

$N \times \frac{1}{3} \times \frac{A}{N} \times r$ = Sphere volume

$\therefore \frac{4}{\cancel{3}}\pi r^{\cancel{3}\,2} = \frac{1}{\cancel{3}} A \cancel{r}$

$A = 4\pi r^2$

Translation: moving

$(x, y) \longrightarrow (x+3, y-1)$

~~Rotation~~ Reflection

Point	Axis	Reflected
(a, b)	x	$(a, -b)$
(a, b)	y	$(-a, b)$
(a, b)	$y = x$	$(-a, -b)$
(a, b)	origin	(b, a)

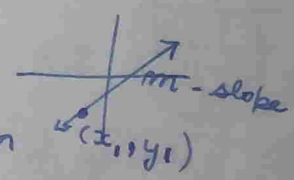
Rotation:

$+90°$ means ↺ anti clockwise

$(x, y) \circlearrowleft 90° \rightarrow (-y, x)$

Geometry X

EdX



Point-slope form: $y - y_1 = m(x - x_1)$