FIND THE 19TH TERM OF $\left(\frac{3}{x} - 2\sqrt{x}\right)^{23} = \left(\underbrace{3x^{-1}}_{x} + \underbrace{(-2x^{\frac{1}{2}})}_{y}\right)^{23}$ ← n

$r = 18$

$$= \sum_{r=0}^{23} \binom{23}{r} (3x^{-1})^{23-r} (-2x^{\frac{1}{2}})^r$$

$$= \sum_{r=0}^{23} (-1)^r \binom{23}{r} 3^{23-r} 2^r x^{r-23+\frac{1}{2}r}$$

$$= \sum_{r=0}^{23} (-1)^r \binom{23}{r} 3^{23-r} 2^r x^{\frac{3}{2}r-23}$$

$$19^{TH}\text{ TERM} = (-1)^{18} \binom{23}{18} 3^{23-18} 2^{18} x^{\frac{3}{2}(18)-23}$$

$$= 23 \cdot 11 \cdot 7 \cdot 19 \cdot 3^5 2^{18} x^4$$

$$\binom{23}{18} = \frac{23!}{18!\,5!} = \frac{23 \cdot \overset{11}{\cancel{22}} \cdot \overset{7}{\cancel{21}} \cdot \cancel{20} \cdot 19 \cdot \cancel{18!}}{\cancel{18!}\ \cancel{5} \cdot 4 \cdot \cancel{3} \cdot \cancel{2} \cdot 1}$$

$$(x+y)^n = \sum_{r=0}^{n} \binom{n}{r} x^{n-r} y^r \quad \text{WHERE}$$

$$\binom{n}{r} = \frac{n!}{r!(n-r)!}$$

FIND THE COEFFICIENT OF x^{10} IN $\left(\frac{3}{x} - 2\sqrt{x}\right)^{23}$

$$= \sum_{r=0}^{23} (-1)^r \binom{23}{r} 3^{23-r} 2^r x^{\frac{3}{2}r-23}$$

$$(-1)^{22} \binom{23}{22} 3^{23-22} 2^{22} x^{\frac{3}{2}(22)-23}$$

$$= \underline{23 \cdot 3 \cdot 2^{22} x^{10}}$$

$\frac{3}{2}r - 23 = 10$

$\frac{3}{2}r = 33$

$r = 33 \cdot \frac{2}{3} = 22$

$\binom{23}{22} = \frac{23!}{22!\,1!} = \frac{23 \cdot 22!}{22!} = 23$

FIND THE COEFFICIENT OF x^{13} IN

$\frac{3}{2}r - 23 = 13$

$\frac{3}{2}r = 36$

$r = 36 \cdot \frac{2}{3} = 24 > 23$

eg. $x^3 - 3x + 7$
COEF OF $x^2 = 0$

x^{13} IS NOT IN THE EXPANSION

COEF OF $x^{13} = 0$

FIND THE COEFFICIENT OF x^6 IN

$\frac{3}{2}r - 23 = 6$

$\frac{3}{2}r = 29$

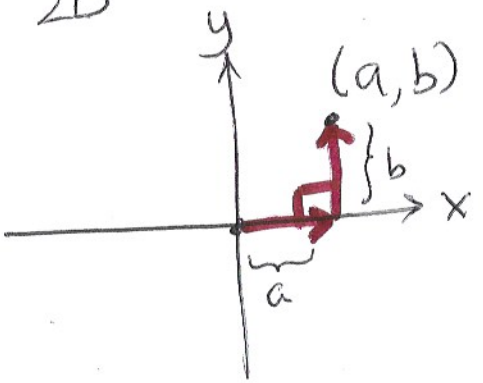
$r = 29 \cdot \frac{2}{3} = \frac{58}{3} = 19\frac{1}{3}$

x^6 IS NOT IN THE EXPANSION

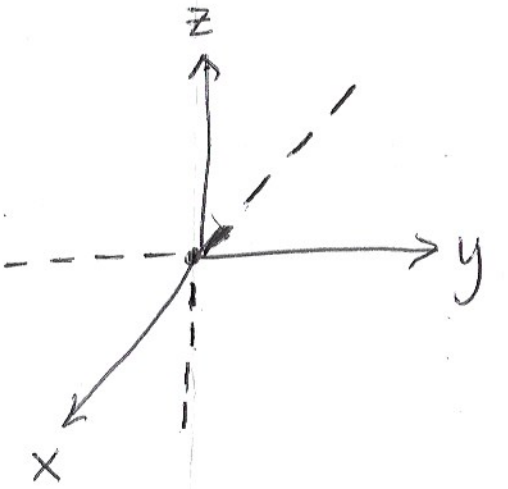
COEF OF $x^6 = 0$

11.1 3D

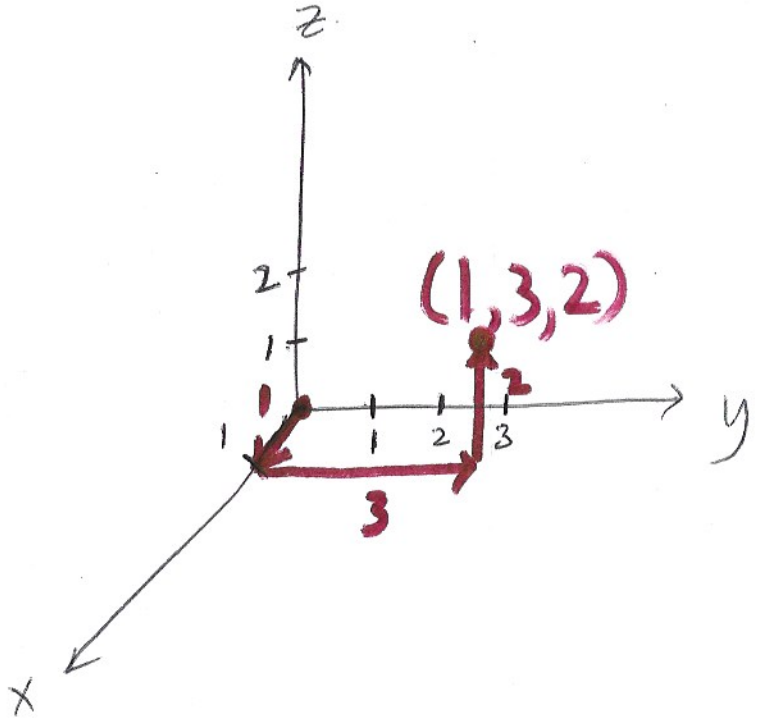
2D

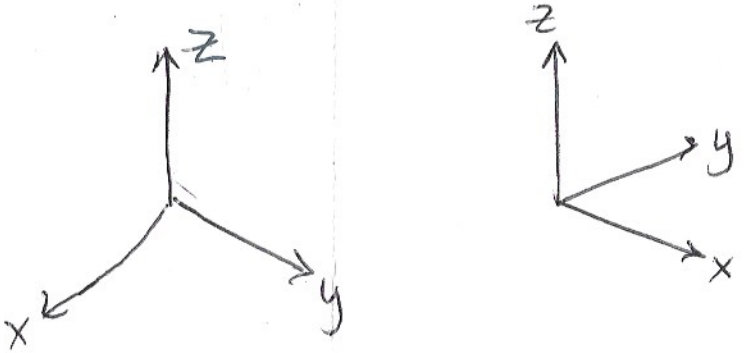


3D

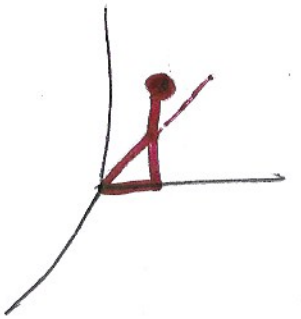


SKETCH POINT $\overset{x}{(1}, \overset{y}{3}, \overset{z}{2})$

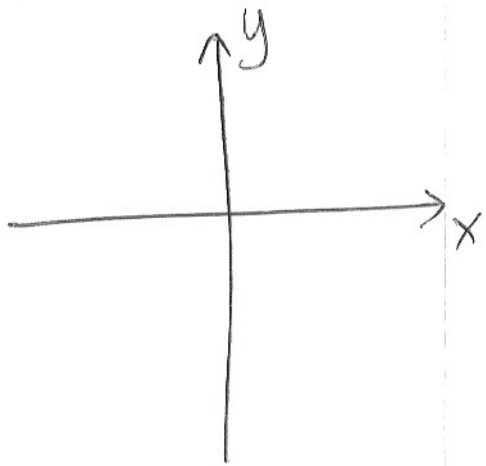




RIGHT HAND RULE



IN 2D



EQ'N OF X-AXIS $y=0$

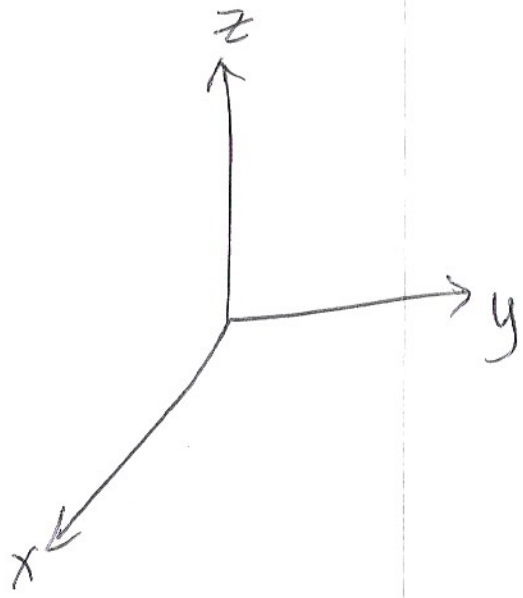
Y-AXIS $x=0$

↑

COORDINATE AXES

↓

IN 3D

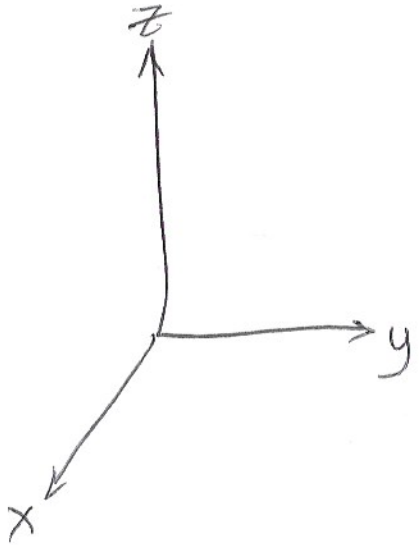


EQN OF X-AXIS $y=0, z=0$ or $y=z=0$

Y-AXIS $x=z=0$

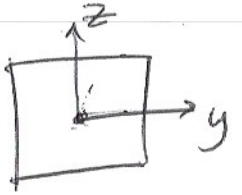
Z-AXIS $x=y=0$

THE COORDINATE PLANES CONTAIN 2 COORDINATE AXES



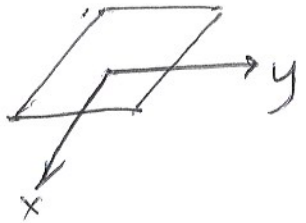
yz-PLANE CONTAINS y-, z-AXES

$x = 0$



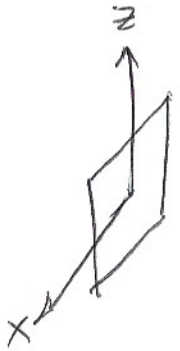
xy-PLANE CONTAINS x-, y-AXES

$z = 0$



xz-PLANE CONTAINS x-, z-AXES

$y = 0$



THE 3 COORDINATE PLANES SUBDIVIDE 3D SPACE INTO 8 OCTANTS

Q_1:	$x>0, y>0, z>0$	O_1	$x>0, y>0, z<0$	O_5
Q_2:	$x<0, y>0, z>0$	O_2	$x<0, y>0, z<0$	O_6
Q_3:	$x<0, y<0, z>0$	O_3	$x<0, y<0, z<0$	O_7
Q_4:	$x>0, y<0, z>0$	O_4	$x>0, y<0, z<0$	O_8