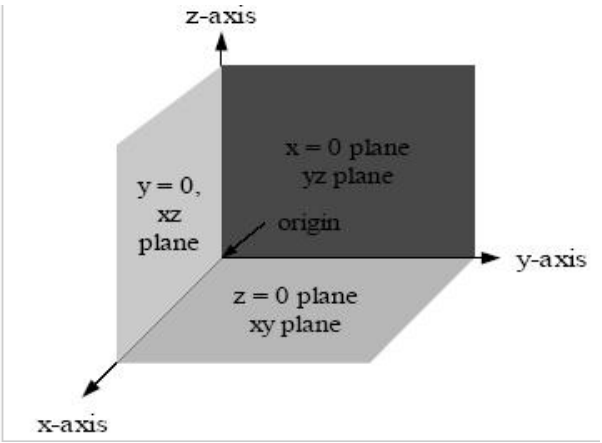
ALGEBRA OF 3-SPACE

- Coordinate geometry that represents space in **three** dimensions
- Coordinates are in the form of an ordered triplet **(x, y, z)**
- Three planes exist: **xy** plane, **xz** plane, **yz** plane



x axis -axis coming "out of the page"

y axis - horzontal axis

z axis - vertical axis

ALGEBRA OF 3-SPACE

Three equations with three unknowns!!

Solving 3 x 3 Systems

REMEMBER:

- you can multiply or divide equations by a constant
- can add & subtract 2 equations to get a new equation
- you can rearrange the order of equations

STEPS:

1) Eliminate one of the variables
2) Solve the 2 x 2 system
3) Use "backward substitution" to obtain a solution

$$2x + y - 3z = -9$$
$$x - y + z = 6$$
$$3x + y - 2z = -5$$

$2x+y-3z=-9$ $\quad x-y+z=6$

$x-y+z=6$ $\quad \oplus\ 3x+y-2z=-5$

$3x-2z=-3$ $\quad 4x-z=1$ "2x2 system"

$3x-2z=-3$

$\hookrightarrow\ 8x-2z=2$

$-5x=-5$

$x=1$

$3x-2z=-3$

$3(1)-2z=-3$

$3-2z=-3$

$-2z=-6$

$z=3$

$x-y+z=6$

$1-y+3=6$

$-y+4=6$

$-y=2$

$y=-2$

$(1,-2,3)$

$$4x + 3y - z = -7$$
$$3x - 2y + 3z = -10$$
$$x + y - z = -2$$

$12x+9y-3z=-21$

(+) $3x-2y+3z=-10$

$15x+7y=-31$

$3x-2y+3z=-10$

(+) $3x+3y-3z=-6$

$6x+y=-16$

$15x+7y=-31$

(-) $42x+7y=-112$

$-27x=81$

$x=-3$

$6x+y=-16$

$6(-3)+y=-16$

$-18+y=-16$

$y=2$

$x+y-z=-2$

$-3+2-z=-2$

$-1-z=-2$

$-z=-1$

$z=1$

$(-3,2,1)$

Homework

② a, e, g

③ a, b, c