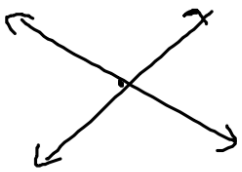
Sec 3-1

System of Linear Equations

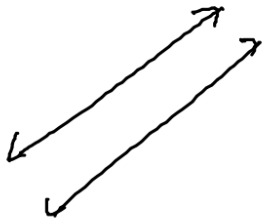
$$\begin{cases} 2x + y = 5 \\ x - y = -2 \end{cases}$$

Possible Solutions



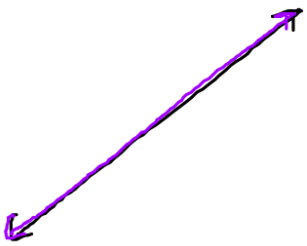
One Solution

Independent



No Solution

Inconsistent



Infinite Solutions

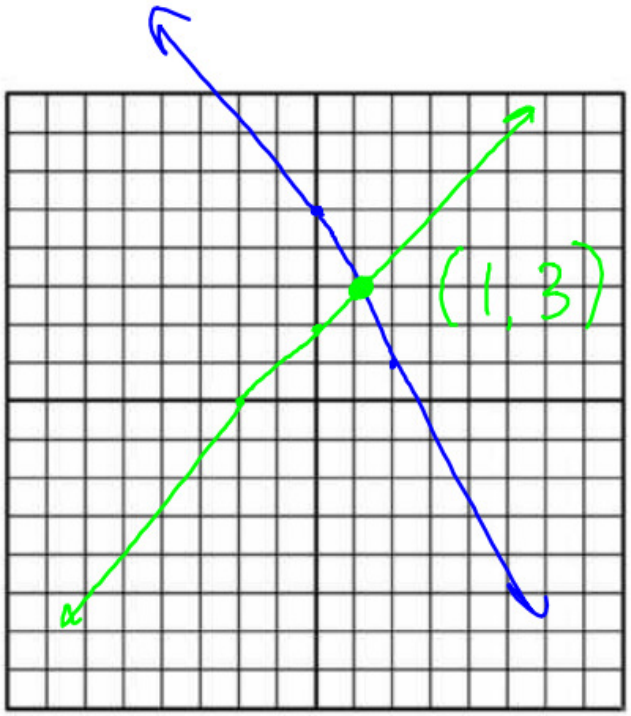
Dependent

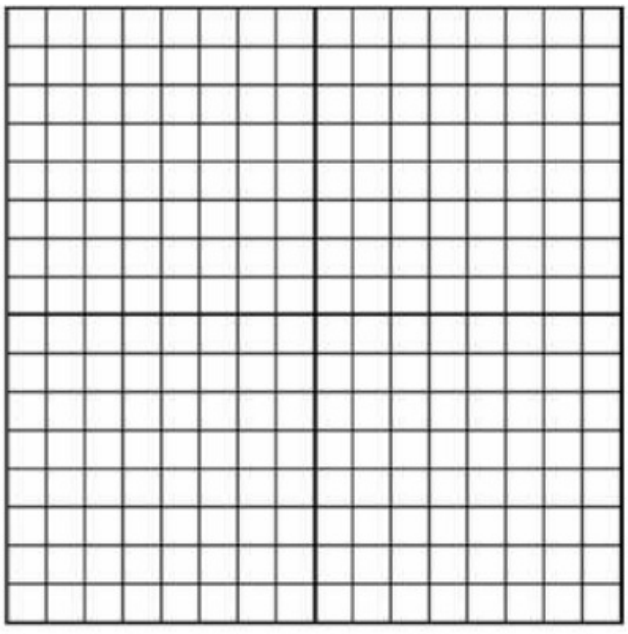
Solving Systems

- Graphing
- Elimination
- Substitution

Solve By Graphing

$$\begin{cases} 2x + y = 5 \\ x - y = -2 \end{cases}$$





Classify Without Graphing

$$\begin{cases} y = 2x + 6 \\ y = 2x - 3 \end{cases} \rightarrow \text{Parallel} \rightarrow \text{Inconsistent}$$

$$\begin{cases} y = 2x + 1 \\ y = 2x + 1 \end{cases} \rightarrow \text{Same Line} \rightarrow \text{Dependent}$$

$$\begin{cases} y = 2x + 1 \\ y = \frac{1}{2}x - 3 \end{cases} \rightarrow \text{Intersecting} \rightarrow \text{Independent}$$

Sec 3-2

Solve By Substitution

$$\begin{cases} 2x - 3y = 6 \\ x + y = -12 \end{cases} \longrightarrow x = \boxed{-y - 12}$$

$2(-y-12) - 3y = 6$

$-2y - 24 - 3y = 6$

$-5y - 24 = 6$

$-5y = 30$

$y = -6$

$x = -(-6) - 12$

$x = 6 - 12 = -6$

$(-6, -6)$

By Elimination

$$\begin{cases} 3x - 2y = 14 \\ 2(x + y = 3) \end{cases} \rightarrow \begin{array}{r} 3x - 2y = 14 \\ 2x + 2y = 6 \\ \hline 5x = 20 \\ x = 4 \end{array}$$

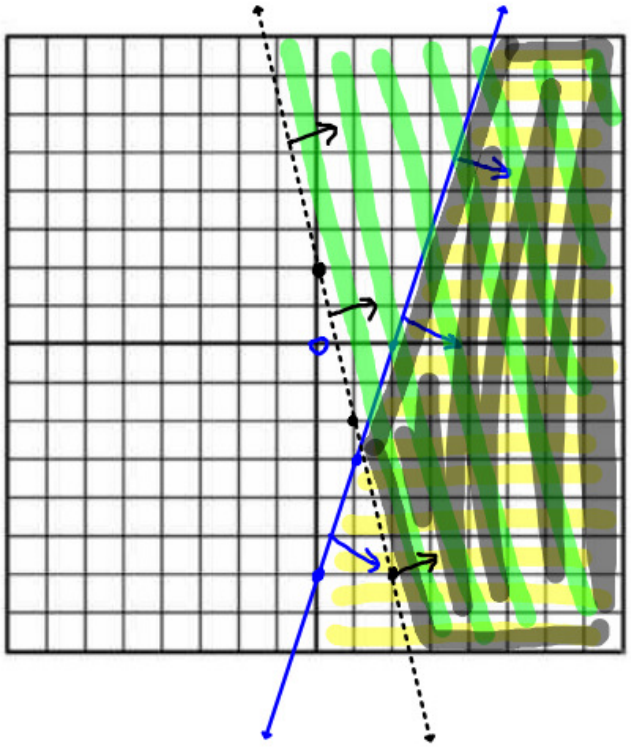
$$4 + y = 3$$

$$y = -1$$

$$(4, -1)$$

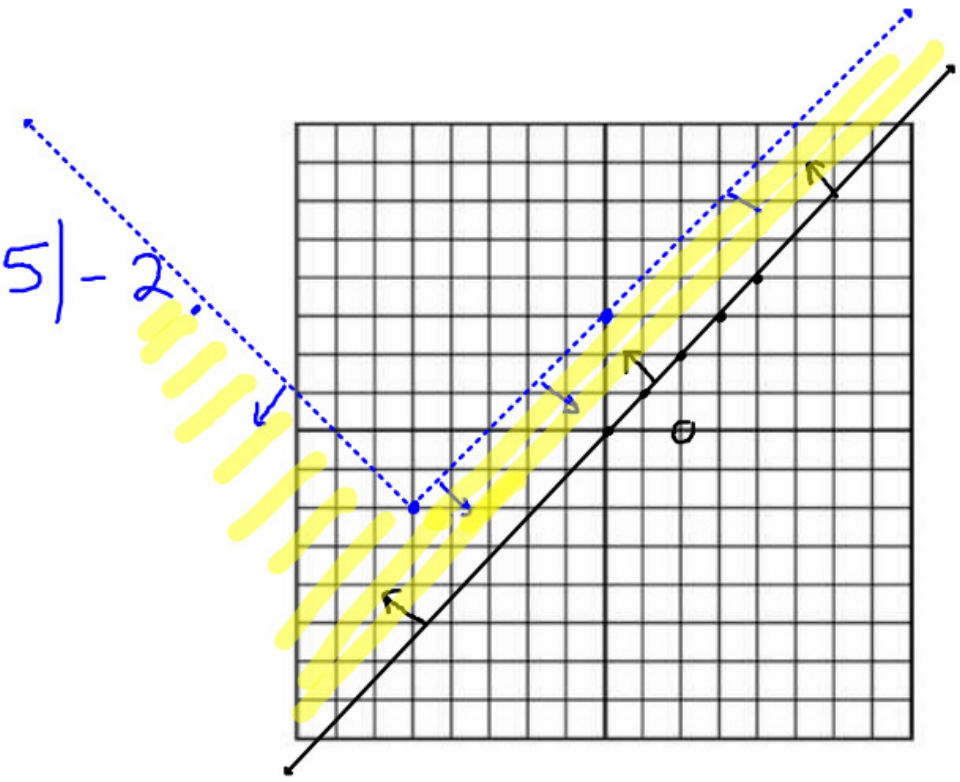
Sec 3-3

$$\begin{cases} y \leq 3x - 6 \\ y > -4x + 2 \end{cases}$$



$$\begin{cases} y \geq x \\ y < |x+5| - 2 \end{cases}$$

x	y
0	3



Sec 3-4

Linear Programming

A furniture manufacturer can make from 30 to 60 tables a day and from 40 to 100 chairs a day. At most, it can make 120 units in one day. The profit on a table is $150 and the profit on a chair is $65. How many tables and chairs should they make every day to maximize profit? How much is that profit?

1) Label variables : write all inequalities (constraints)

X = # of tables made in a day

Y = # of chairs made in a day

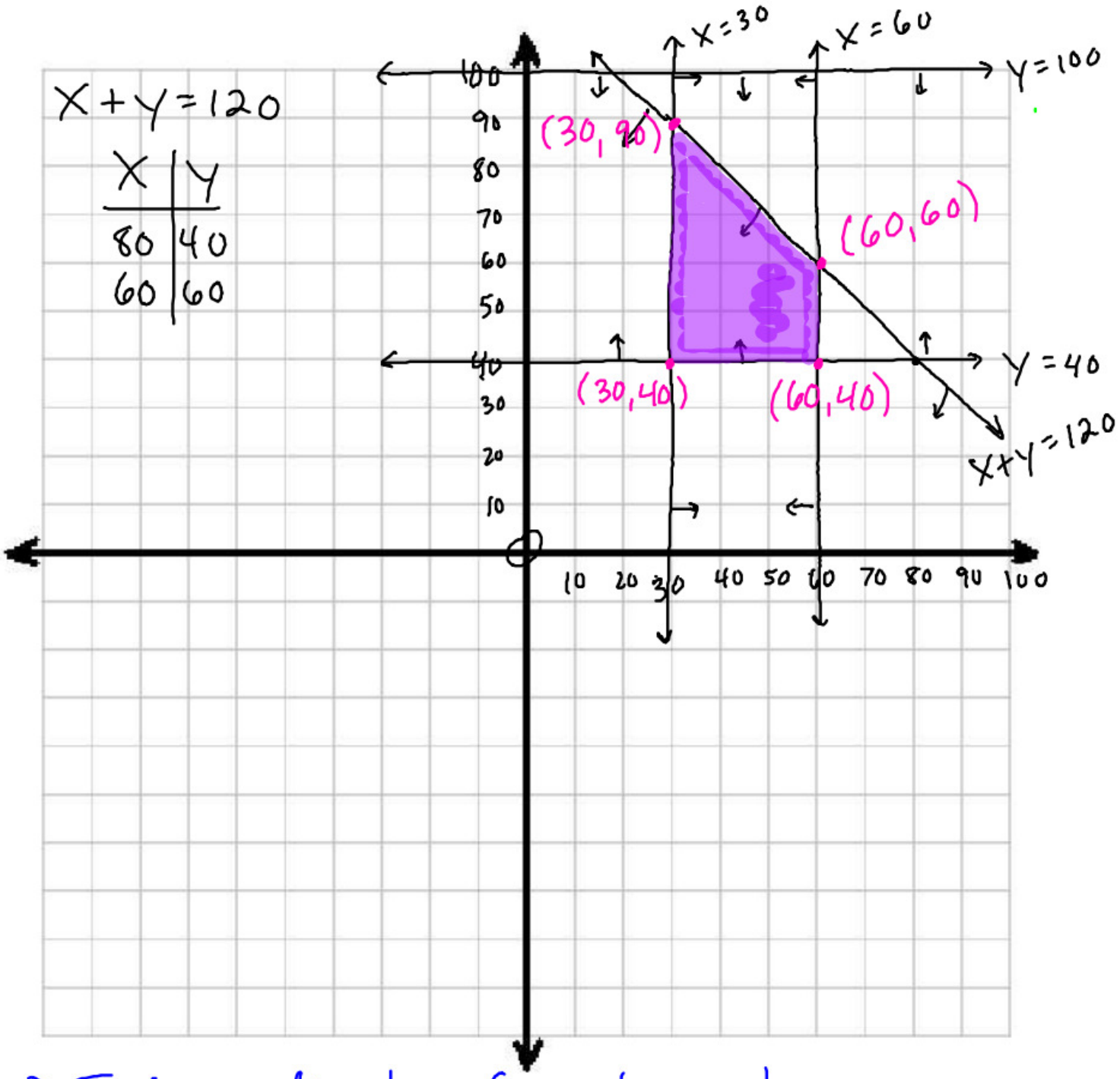
$X \geq 30$ $\quad Y \geq 40$ $\quad X + Y \leq 120$

$X \leq 60$ $\quad Y \leq 100$

2) Graph Inequalities / Constraints

$X + Y = 120$

X	Y
80	40
60	60



3) Find coordinates of each vertex

4) Write profit / cost equation; Evaluate

$$P = 150x + 65y$$

$P = 150(30) + 65(90) = \$10,350$

$P = 150(60) + 65(40) = \$11,600$

→ $P = 150(60) + 65(60) = \$12,900$

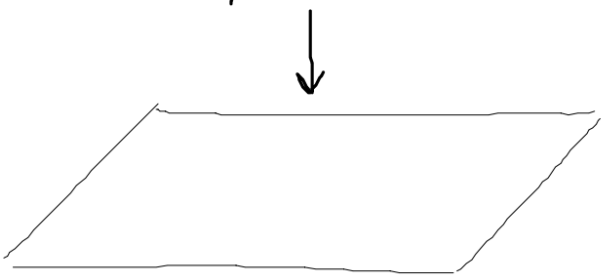
$P = 150(30) + 65(40) = \$7,100$

Secs 3-5 and 3-6

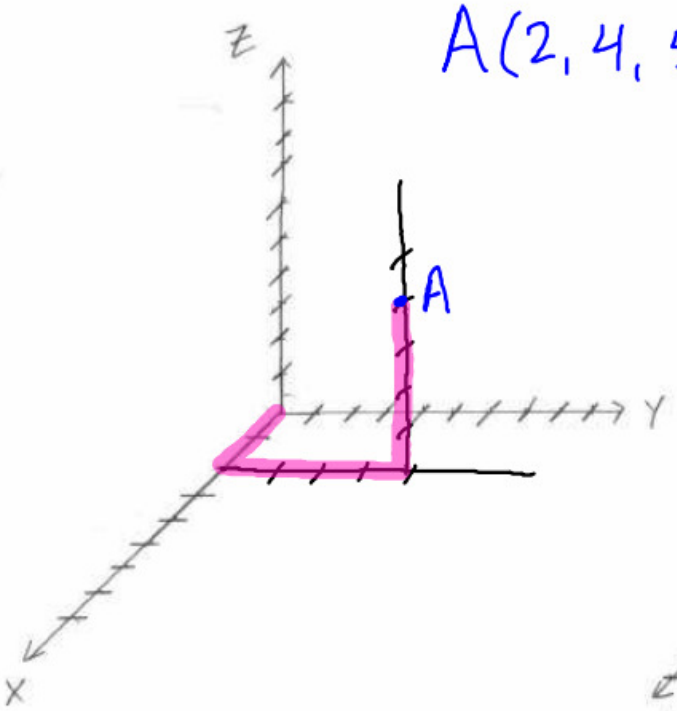
Graphs In Space

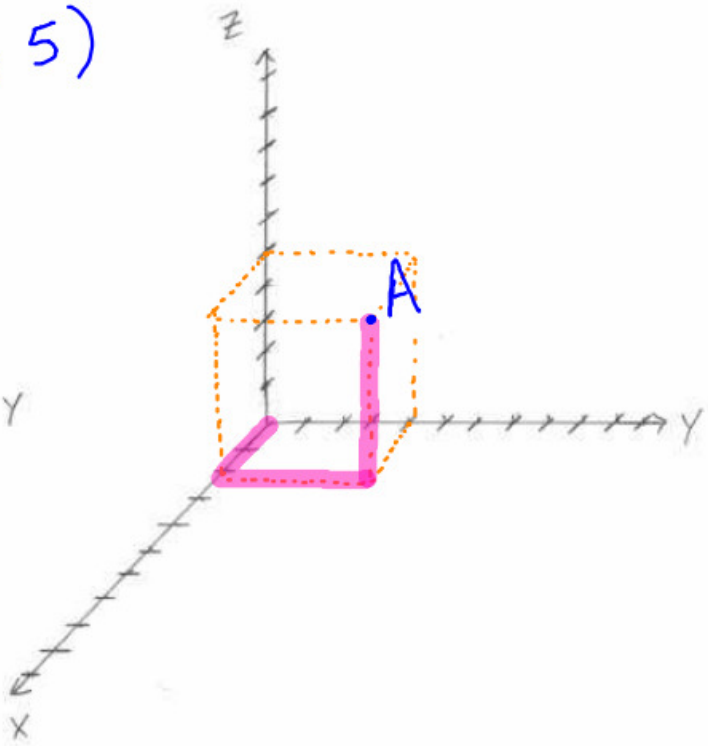
- $A(x, y, z)$

$$Ax + By + Cz = D$$

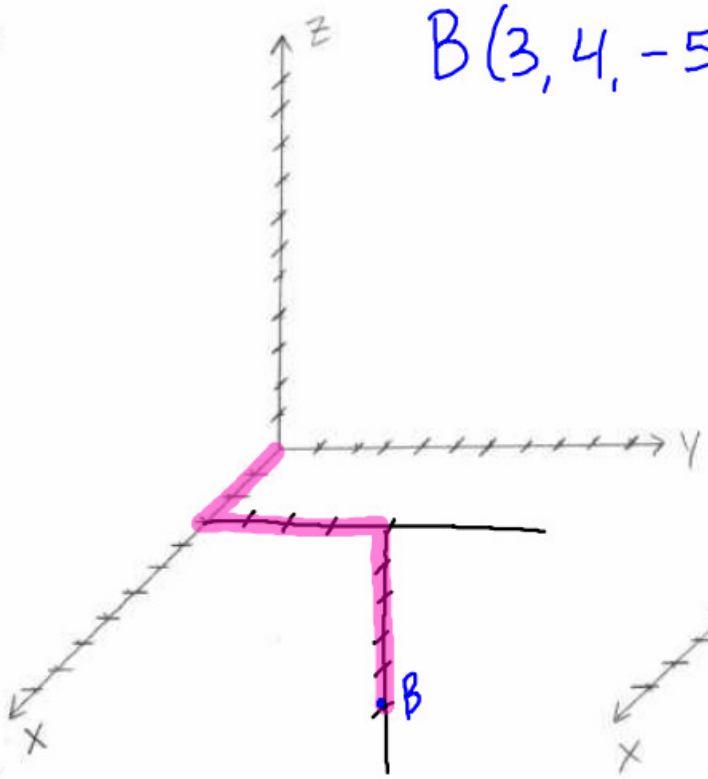


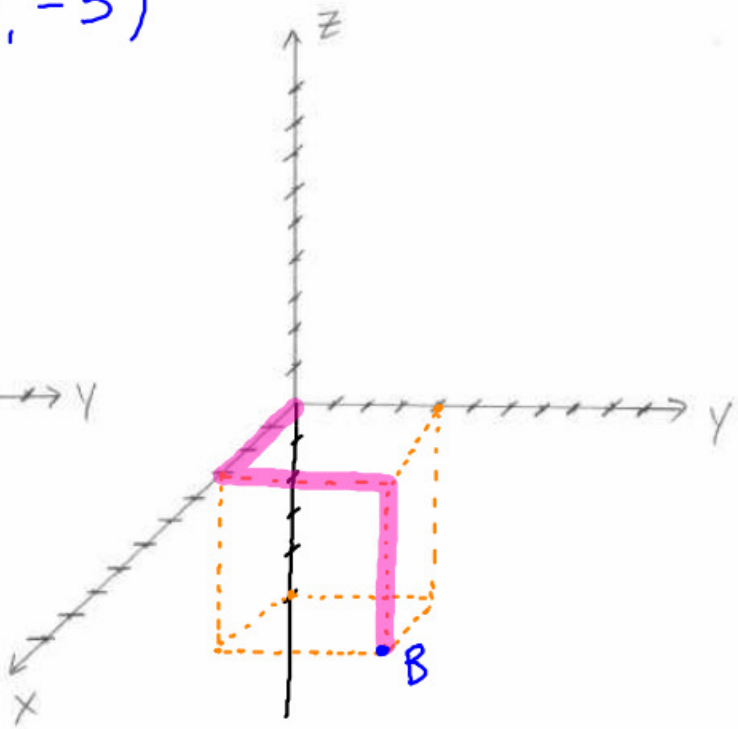
A(2, 4, 5)





B(3, 4, -5)



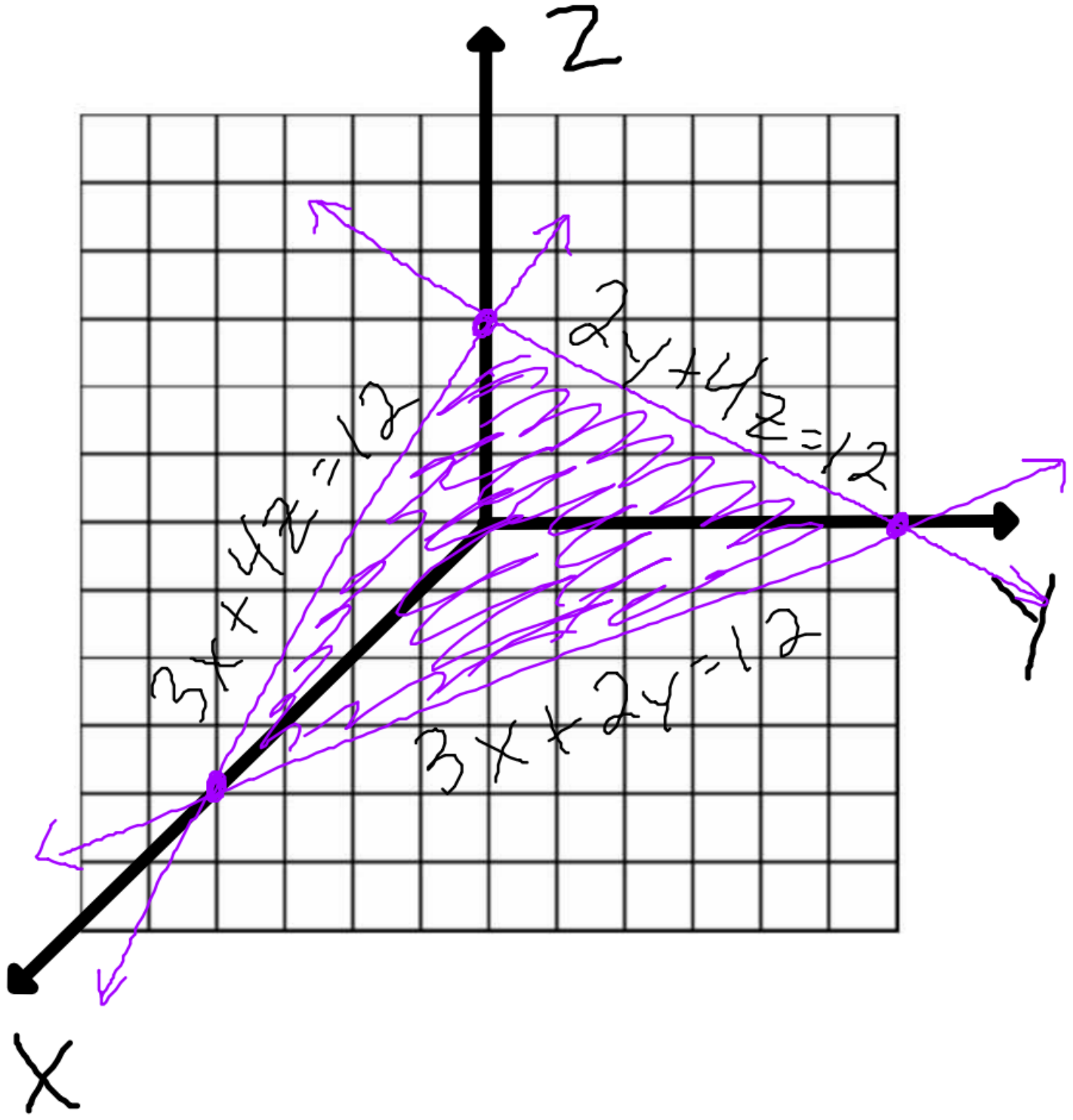


Graphing Planes

Ex $3x + 2y + 4z = 12$

x	y	z
4	0	0
0	6	0
0	0	3

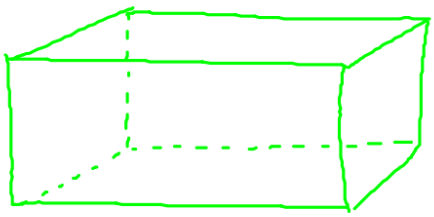
} Find x, y and z intercepts



$$3x+2y+4z=12$$

Systems With 3 Variables

- No Solution
- Infinite Solutions
- Exactly One Solution



Solving Systems

- Substitution
- Elimination

Solve By Substitution

$$\begin{cases} x + 3y - z = -4 \\ 2x - y + 2z = 13 \\ 3x - 2y - z = -9 \end{cases}$$

$x + 3y - z = -4 \longrightarrow x = -3y + z - 4$

$2(-3y + z - 4) - y + 2z = 13 \longrightarrow 4z - 7y = 21$

$3(-3y + z - 4) - 2y - z = -9 \longrightarrow 2z - 11y = 3$

$2(2z - 11y = 3)$

$4z - 22y = 6$

$4z = 22y + 6$

$4z - 7y = 21$

$(22y + 6) - 7y = 21$

$15y = 15$

$y = 1 \longrightarrow z = 7 \longrightarrow x = 0$

$(0, 1, 7)$

Solve By Elimination

$$\begin{cases} -2(x+2y+z=4) \\ 2x-y+4z=-8 \\ 3x-y+2z=1 \end{cases}$$

$-2(x+2y+z=4) \rightarrow -2x-4y-2z=-8$

$2x-y+4z=-8$

$$\boxed{-5y+2z=-16}$$

$-3(x+2y+z=4) \rightarrow -3x-6y-3z=-12$

$3x-y+2z=1$

$$\boxed{2(-7y-z=-11)}$$

$-14y-2z=-22$

$-5y+2z=-16$

$-19y=-38$

$y=2$

$z=-3$

$x=3$

$(3, 2, -3)$