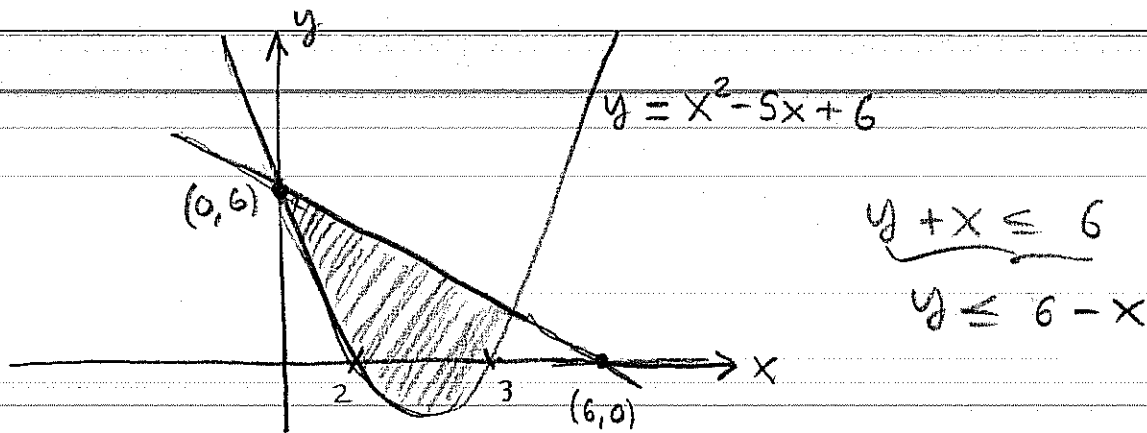


MATH 121 - QUIZ 9 - LINEAR EQUATIONS & SYSTEMS OF INEQUALITIES  
AND CONIC SECTIONS

150 pts possible, 30 pts a piece.

**PROBLEM 1** Graph the inequalities  $y \geq x^2 - 5x + 6$  and  $y + x \leq 6$ . Shade the sol<sup>n</sup> set.

$$x^2 - 5x + 6 = (x-3)(x-2) \leq y$$



**PROBLEM 2** Consider the system

$$\begin{aligned} x + y + 2z &= 1 \\ x + 2y &= 7 \\ 2x + z &= 10 \end{aligned}$$

Convert this to a single matrix equation  $AV = b$

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 0 \\ 2 & 0 & 1 \end{bmatrix} \quad V = \begin{bmatrix} x \\ y \\ z \end{bmatrix} \quad b = \begin{bmatrix} 1 \\ 7 \\ 10 \end{bmatrix}$$

**PROBLEM 3** Given that for  $A$  in Problem 2 we have  $A^{-1} = \frac{1}{7} \begin{bmatrix} -2 & 1 & 4 \\ 1 & 3 & -2 \\ 4 & -2 & -1 \end{bmatrix}$  solve the system of equations from Problem 2 by multiplication by  $A^{-1}$ .

$x = 45/7$   
 $y = 2/7$   
 $z = -20/7$

$$V = A^{-1}b = \frac{1}{7} \begin{bmatrix} -2 & 1 & 4 \\ 1 & 3 & -2 \\ 4 & -2 & -1 \end{bmatrix} \begin{bmatrix} 1 \\ 7 \\ 10 \end{bmatrix} = \frac{1}{7} \begin{bmatrix} -2+7+40 \\ 1+21-20 \\ 4-14-10 \end{bmatrix} = \begin{bmatrix} 45/7 \\ 2/7 \\ -20/7 \end{bmatrix}$$

**PROBLEM 4** Solve the following system of equations by a method of your choosing.

$$x + y + z = 6$$

$$x - z = 0$$

$$x + y - z = 2$$

$$\xrightarrow{\text{add}} 2x + y = 6$$

$$\xrightarrow{\text{subtract}} y = 2$$

$$\rightarrow 2x = 4 \rightarrow \underline{x = 2}$$

$$\rightarrow z = x = 2$$

$$x = 2$$

$$y = 2$$

$$z = 2$$

**PROBLEM 5** Multiply the matrices A and B given below

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

$$B = \begin{bmatrix} 0 & 7 \\ 5 & 2 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 0 & 7 \\ 5 & 2 \end{bmatrix} = \underline{\underline{\begin{bmatrix} 10 & 11 \\ 20 & 29 \end{bmatrix}}}$$

**PROBLEM 6** If a system  $Av = b$  has  $v = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$  and

$$\text{rref} [A | b] = \left[ \begin{array}{ccc|c} 1 & 0 & 0 & 5 \\ 0 & 1 & 0 & 7 \\ 0 & 0 & 1 & 9 \end{array} \right] \text{ then what is the}$$

Sol<sup>n</sup>? FILL IN BLANKS!

$$\underline{x = 5}, \quad \underline{y = 7}, \quad \underline{z = 9}$$