Problem 1

Part 1

① $y = -0.5x + 2 \rightarrow 0.5x + y - 2z = 0$

① $3x + 6y = 5 \Rightarrow 3x + 6y - 5z = 0$

$L_1 = (0.5, 1, -2)$

$L_2 = (3, 6, -5)$

$$L_1 \times L_2 = \begin{array}{ccc} i & j & k \\ \hline \end{array}$$
$$\begin{bmatrix} 0.5 & 1 & -2 \\ 3 & 6 & -5 \end{bmatrix}$$

$$\Delta = (1(-5) - (-2)(6))i + [((-2)(3) - (0.5)(-5))]j + ((0.5)(6) - (1)(3))$$

$$(-5 + 12)i + [-6 + 2.5]j + [3 - 3]k$$

$$7i - 3.5j + 0k$$

$$(7, 3.5, 0)$$

* no intersection since $z = 0$

Part2

ideal point $= [x, y, 0]$ line at infinity $w = 0$

$[7, 3.5, 0]$ since z or $w = 0$ it lies on the line of infinity

Part3

in homogeneous form

$(0.5x + y - 2)(3x + 6y - 5) = 0$

$(0.5x)(3x) + (0.5x)(6y) + (0.5x)(-5) + (y)(3x) + (y)(6y) + (y)(-5) + (-2)(3x) + (-2)(6y) + (-2)(-5) = 0$

$1.5x^2 + 3xy - 2.5x + 3xy + 6y^2 - 5y - 6x - 12y + 10 = 0$

$1.5x^2 + 6xy - 8.5x + 6y^2 - 17y + 10 = 0$

homogeneous form

$$1.5(x/w)^2 + 6(x/w)(y/w) + 6(y/w)^2 - 8.5(x/w) - 17(y/w) + 10 = 0$$

multiply by w^2

$$1.5x^2 + 6xy + 6y^2 - 8.5xw - 17yw + 10w^2 = 0$$

Matrix form

$$C = \begin{bmatrix} A & B & D \\ B & C & E \\ D & E & F \end{bmatrix} = \begin{bmatrix} 1.5 & 3 & -4.25 \\ 3 & 6 & -8.5 \\ -4.25 & -8.5 & 10 \end{bmatrix}$$

$$\begin{bmatrix} x & y & w \end{bmatrix} \begin{bmatrix} 1.5 & 3 & -4.25 \\ 3 & 6 & -8.5 \\ -4.25 & -8.5 & 10 \end{bmatrix} \begin{bmatrix} x \\ y \\ w \end{bmatrix} = 0$$