

NAME:

**Problem 1 (7.5 points):**

A band has two goods: funk and noise. The production of one unit of funk requires .2 units of funk and .6 units of noise. The production of one unit of noise requires .4 units of funk and .4 units of noise. Find the production schedule that meets the external demand for 8 units of funk and 24 units of noise.

**Solution:**

We know  $\mathbf{A} = \begin{bmatrix} .2 & .4 \\ .6 & .4 \end{bmatrix}$  and  $\mathbf{D} = \begin{bmatrix} 8 \\ 24 \end{bmatrix}$ , so we must solve  $\mathbf{A}\mathbf{X} + \mathbf{D} = \mathbf{X}$  for  $\mathbf{X}$ . Thus:

$$\begin{aligned} \mathbf{D} &= \begin{bmatrix} 8 \\ 24 \end{bmatrix} = \mathbf{X} - \mathbf{A}\mathbf{X} \\ &= (\mathbf{I} - \mathbf{A})\mathbf{X} \\ &= \left( \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} .2 & .4 \\ .6 & .4 \end{bmatrix} \right) \mathbf{X} \\ &= \begin{bmatrix} .8 & -.4 \\ -.6 & .6 \end{bmatrix} \mathbf{X} \end{aligned}$$

Now we can row reduce to obtain  $\mathbf{X} = \begin{bmatrix} 60 \\ 100 \end{bmatrix}$ .

**Problem 2 (7.5 points):**

Graph and shade the set of points which satisfy the following system of inequalities (feel free to use the back of the paper).

$$\begin{aligned} y &\geq 0 \\ y &\leq 2x \\ y &\leq -x + 9 \end{aligned}$$

Label the corner points of the region you obtain.

**Solution:**

The region is a triangle with corners  $(0, 0)$ ,  $(3, 6)$ ,  $(9, 0)$ .