4

$$K(w) = \begin{cases} 0 : & w \leq 0 \\ w : & w > 0 \end{cases}$$

a) Yes

b) No

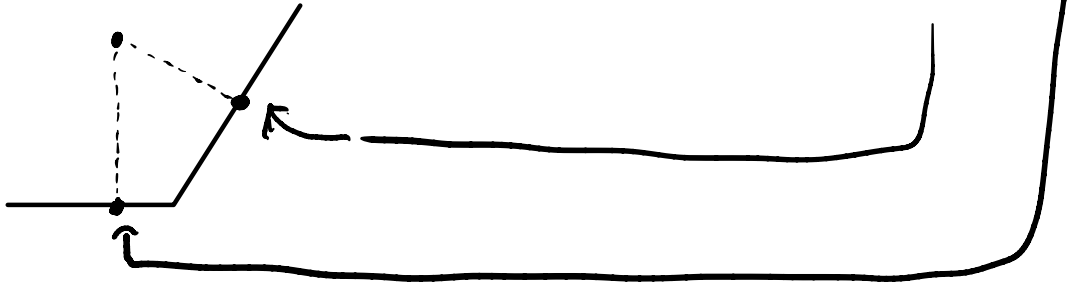
c) Yes.

$$\begin{bmatrix} v_1 \\ v_2 \end{bmatrix} = \begin{bmatrix} -1 \\ 4 \end{bmatrix} \quad \begin{bmatrix} w \\ x \end{bmatrix} = \begin{bmatrix} -1 \\ 0 \end{bmatrix}$$

Local opt

$$\begin{bmatrix} w^* \\ x^* \end{bmatrix} = \begin{bmatrix} 3/2 \\ 3/2 \end{bmatrix}$$

Global opt



d)

$$\begin{cases} v_1 \le 0 \\ v_2^2 \le 2\left(\frac{v_1}{2} - \frac{v_2}{2}\right)^2 \\ v_2 \ge 0 \end{cases} \Rightarrow \begin{cases} \omega = v_1 \\ x = 0 \end{cases}$$

$$\begin{cases} v_1 \le 0 \\ v_2 \le 0 \end{cases} \Rightarrow \begin{cases} \omega = v_1 \\ x = 0 \end{cases}$$

$$\begin{cases} v_1 \ge 0 \\ v_2 \le -v_1 \end{cases} \Rightarrow \omega = v = 0$$

$$\begin{cases} v_1 \ge 0 \\ v_2 \ge -v_1 \end{cases} \Rightarrow \omega = v = \frac{v_1 + v_2}{2}$$

$$\begin{cases} v_1 \le 0 \\ v_2^2 \ge 2\left(\frac{v_1}{2} - \frac{v_2}{2}\right)^2 \end{cases} \Rightarrow \omega = v = \frac{v_1 + v_2}{2}$$