

Before Class Activity

$$1. \sqrt{0.5^2 + 0.5^2} = \sqrt{0.5^2 + 0.5^2} = \sqrt{0.25 + 0.25} = \sqrt{0.5} = 0.707106781$$

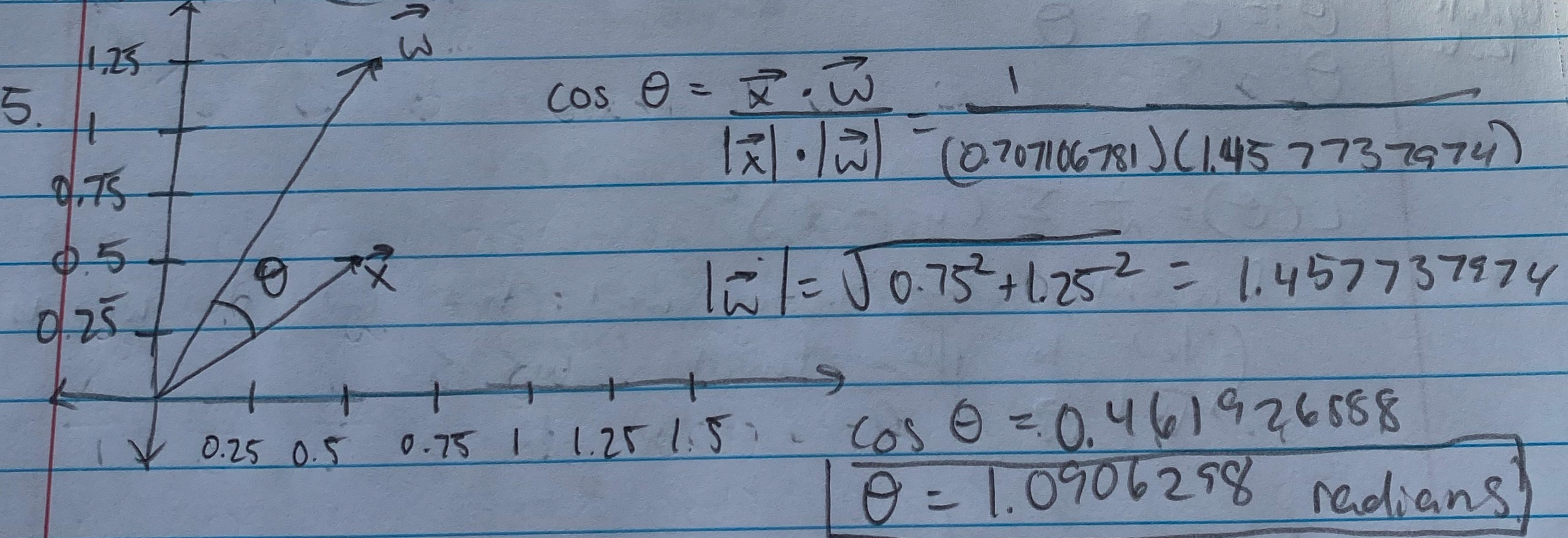
$$2. \vec{x} = [0.5, 0.5] \quad \vec{w} = [0.75, 1.25]$$

$$\begin{bmatrix} 0.5 & 0.5 \end{bmatrix} \begin{bmatrix} 0.75 \\ 1.25 \end{bmatrix} = (0.75 \cdot 0.5) + (0.5 \cdot 1.25) = 0.375 + 0.625 = 1$$

$$3. \vec{x} = [0.5, 0.5], \vec{w} = [0.75, 1.25]$$

$$\vec{x}^\top \cdot \vec{w} = \begin{bmatrix} 0.5 \\ 0.5 \end{bmatrix} \cdot [0.75 \quad 1.25] = (0.5 \cdot 0.75) + (0.5 \cdot 1.25) = 1$$

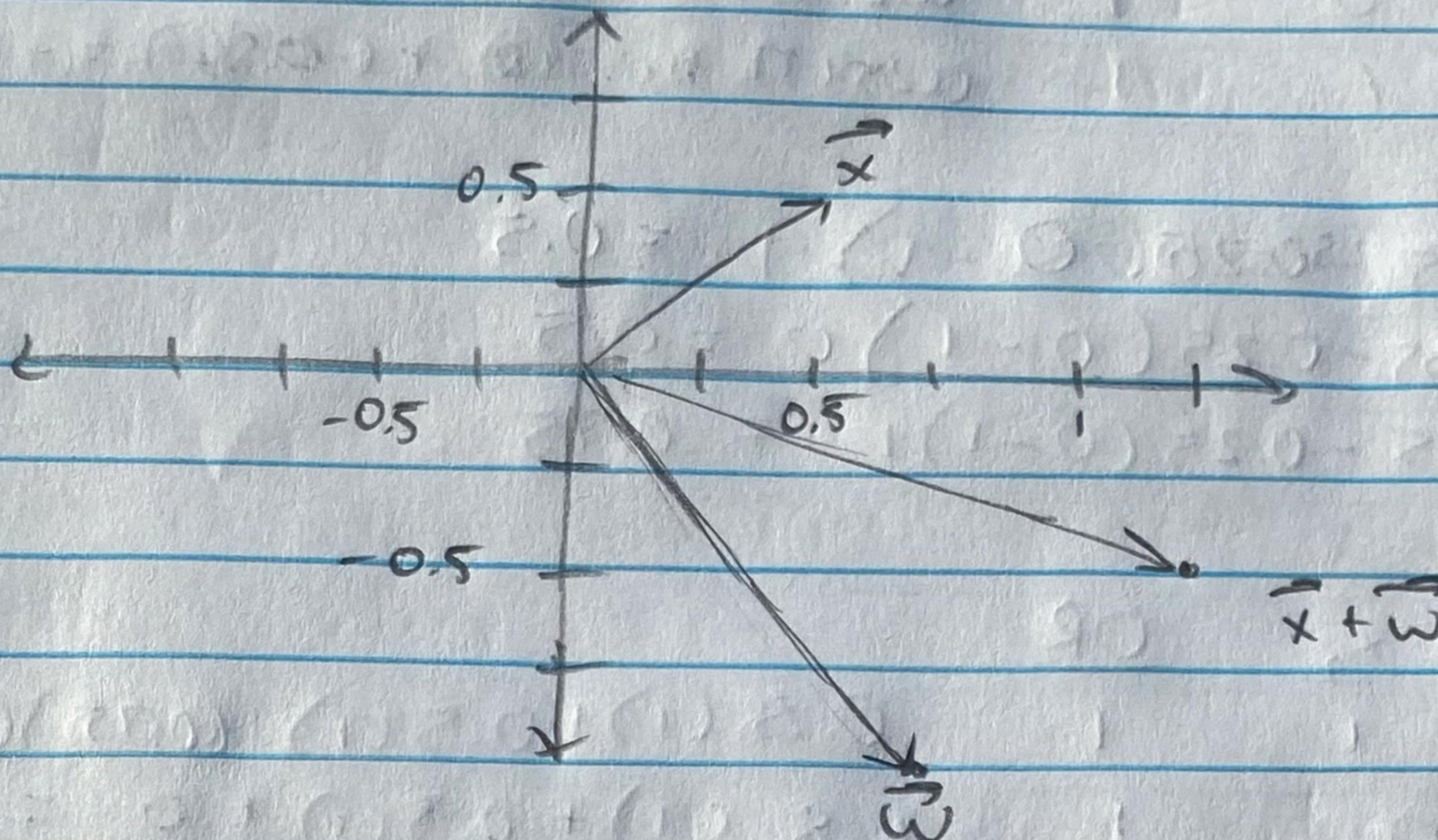
$$4. \vec{x} \cdot \vec{w} = (0.5 \cdot 0.75) + (0.5 \cdot 1.25) = 1$$



$$6. \vec{x} = [0.5, 0.5] \quad \vec{\omega} = [0.75, -1]$$

$$\vec{x} + \vec{\omega} = [0.5] + [0.75] = \boxed{[1.25]}$$

$$[0.5] + [-1] = \boxed{-0.5}$$



7. Classification takes existing information, and, based on the information, assigns a label that groups the information alongside similar pieces of information. On the other hand, prediction extrapolates on unknown pieces of information based on underlying trends of existing data.
 Classification groups data, prediction extrapolates

$$8. \begin{array}{|c|c|c|c|} \hline x_0 & x_1 & x_2 & \text{OR} \\ \hline 1 & 0 & 0 & 0 \\ \hline 1 & 0 & 1 & 1 \\ \hline \end{array} \quad w_0 = 0 \quad w_1 = 0.5 \quad w_2 = -0.5 \quad v = 0.25$$

$$0(1) + 0.5(0) + (-0.5)(0) = 0 \checkmark$$

$$0(1) + 0.5(0) + (-0.5)(1) = -0.5 \neq 0$$

$$w_0 = 0 - 0.25(0 - 1) = 0.25$$

$$w_1 = 0.5 - 0.25(0 - 1) = 0.5$$

$$w_2 = -0.5 - 0.25(0 - 1) = -0.5$$

$$w_0 = 0 - 0.25(-0.5 - 1) = 0.375$$

$$w_1 = 0.5 - 0.25(-0.5 - 1) = 0.6875$$

$$w_2 = -0.5 - 0.25(-0.5 - 1) = -0.6875$$

$$w_0 = 0.25 \quad w_1 = 0.5 \quad w_2 = -0.5$$

x_0 x_1 x_2 OR

$$\begin{array}{cccc|c} 1 & 1 & 1 & | & 0.25(1) + 0.5(1) + (-0.5)(1) = 0.25 \checkmark \\ 1 & 1 & 0 & | & 0.25(1) + 0.5(1) + 0 = 0.75 \checkmark \\ 1 & 0 & 1 & | & 0.25(1) + 0.5(0) + (-0.5)(1) = -0.25 X \end{array}$$

$$w_0 = 0.25 - 0.25(0-1) \cdot 1 = 0.5$$

$$w_1 = 0.5 - 0.25(0-1) \cdot 0 = 0.5$$

$$w_2 = -0.5 - 0.25(0-1) \cdot 1 = 0.75$$

x_0 x_1 x_2 OR

$$\begin{array}{cccc|c} 1 & 1 & 1 & | & 0.5(1) + 0.5(1) + (0.75)(1) = 1.75 \checkmark \\ 1 & 1 & 0 & | & 0.5(1) + 0.5(1) + 0 = 1 \checkmark \\ 1 & 0 & 0 & | & 0.5(1) + 0.5(0) + 0 = 0.5 X \end{array}$$

$$w_0 = 0.5 - 0.25(0-0) \cdot 1 = 0.25$$

x_0 x_1 x_2 OR

$$\begin{array}{cccc|c} 1 & 0 & 0 & | & 0.25(1) + 0 + 0 = 0.25 X \end{array}$$

$$w_0 = 0.25 - 0.25(1-0) \cdot 1 = 0$$

$$w_0 = 0 \quad w_1 = 0.5 \quad w_2 = -0.5$$

x_0 x_1 x_2 OR

$$\begin{array}{cccc|c} 1 & 0 & 0 & | & 0(1) + 0.5(0) + 0.5(1) = 0 \checkmark \\ 1 & 0 & 1 & | & 0(1) + 0.5(1) + 0.5(0) = 0.5 \checkmark \\ 1 & 1 & 1 & | & 0(1) + 0.5(1) + 0.5(1) = 1 \checkmark \\ 1 & 1 & 0 & | & 0(1) + 0.5(1) + 0.5(0) = 1 \checkmark \end{array}$$