Consider the following training data set:

x_1	x_2	x_3	y
+	+	+	yes
+	+	+	yes
+	+	-	yes
+	+	-	yes
+	-	+	yes
+	-	+	yes
+	+	-	yes
-	+	-	no
-	+	+	yes
+	+	+	yes
+	+	-	yes
-	+	-	no
+	-	+	no
-	-	+	no
-	-	-	no
-	-	-	no

Each instance in the data set has three features x_1, x_2 and x_3 and a target value y. $x = [x_1 \quad x_2 \quad x_3]^T$ is the input feature vector. The features take values of "+" and "-", and y takes values of "yes" and "no".

Classify the input $x = [- \quad + \quad -]^T$ using the **"naïve" Bayes classifier model**. *Show the details of the steps of the classification process.*

$$P(y = yes) = \frac{10}{16} = 0.625 \qquad P(y = no) = \frac{6}{16} = 0.375$$

$$P(\vec{x} \mid y = yes) = P(x_1 = -, x_2 = +, x_3 = - \mid y = yes)$$

$$= P(x_1 = - \mid y = yes) \cdot P(x_2 = + \mid y = yes) \cdot P(x_3 = - \mid y = yes)$$

$$= \frac{1}{10} \cdot \frac{8}{10} \cdot \frac{4}{10} = \frac{32}{1000} = 0.032$$

$$P(\vec{x} \mid y = no) = P(x_1 = -, x_2 = +, x_3 = - \mid y = no)$$

$$= P(x_1 = - \mid y = no) \cdot P(x_2 = + \mid y = no) \cdot P(x_3 = - \mid y = no)$$

$$= \frac{5}{6} \cdot \frac{2}{6} \cdot \frac{4}{6} = \frac{5}{27} = 0.185$$

$$P(y = yes \mid \vec{x}) = P(\vec{x} \mid y = yes) P(y = yes)$$

$$= 0.032 \times 0.625 = 0.02$$

$$P(y = no \mid \vec{x}) = P(\vec{x} \mid y = no) P(y = no)$$

$$= 0.185 \times 0.375 = 0.069$$

$$P(y = no \mid \vec{x}) > P(y = yes \mid \vec{x})$$

Thus, $\vec{x}$ is classified into "no" class