HW 2 - Bhavya Patel

Q1

$$P(D|N) = \frac{1}{3}, \qquad P(D|N') = \frac{3}{5}$$

$$P(B|N) = \frac{2}{3}, \qquad P(B|N') = \frac{2}{5}$$

$$P(W'|N) = \frac{1}{3}, \qquad P(W'|N') = \frac{4}{5}$$

$$P(N) = \frac{3}{8}, \qquad P(N') = \frac{5}{8}$$

$$P(N = Yes \mid D, B, W') = \frac{\frac{1}{3} \times \frac{2}{3} \times \frac{1}{3} \times \frac{3}{8}}{\frac{1}{3} \times \frac{2}{3} \times \frac{1}{3} \times \frac{3}{8} + \frac{3}{5} \times \frac{2}{5} \times \frac{4}{5} \times \frac{5}{8}}$$

$$= \frac{0.028}{0.028 + 0.12} = \frac{0.028}{0.148} = \boxed{0.189}$$

Q2   Test Point: $(3.8, 1.2)$, $k = 3$

Dist. to $(4, 1)$ [A] $= \sqrt{(3.8-4)^2 + (1.2-1)^2} = 0.28$

Dist. to $(3, 1)$ [B] $= \sqrt{(3.8-3)^2 + (1.2-1)^2} = 0.82$

Dist. to $(3, 1.5)$ [B] $= \sqrt{(3.8-3)^2 + (1.2-1.5)^2} = 0.85$

Top 3 nearest neighbors: $(4, 1)$ [A], $(3, 1)$ [B], $(3, 1.5)$ [B]
Majority Class : $\boxed{\text{Class B}}$