

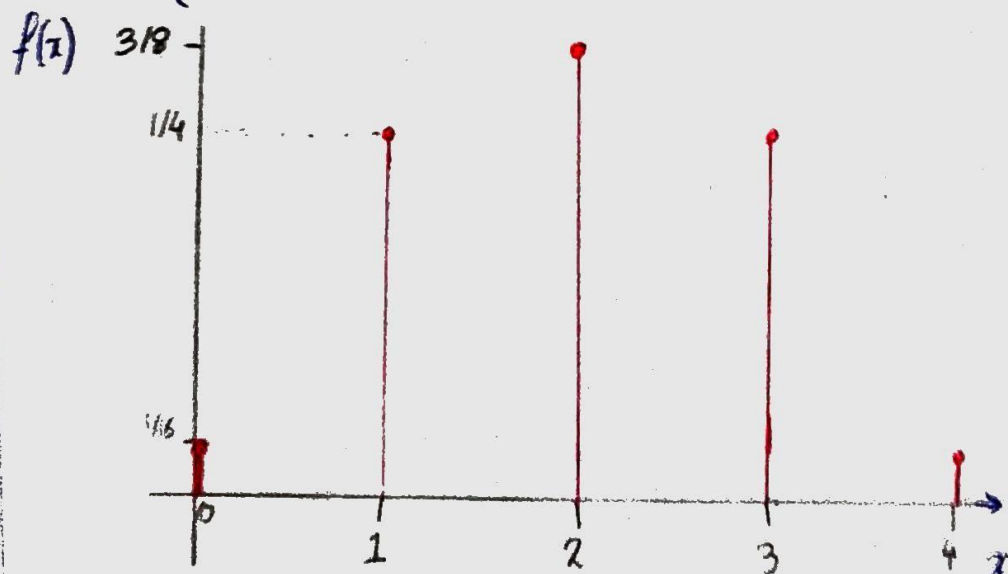
Question 1

$$F(x) = \begin{cases} 0 & x < 0 \\ \frac{1}{16} & 0 \leq x < 1 \\ \frac{5}{16} & 1 \leq x < 2 \\ \frac{11}{16} & 2 \leq x < 3 \\ \frac{15}{16} & 3 \leq x < 4 \\ 1 & x \geq 4 \end{cases}$$

$$f(x) = F(x) - F(x-1)$$

in this case

$$a) f(x) = \begin{cases} 0 & x < 0 \\ \frac{1}{16} & x = 0 \\ \frac{4}{16} = \frac{1}{4} & x = 1 \\ \frac{3}{8} & x = 2 \\ \frac{1}{4} & x = 3 \\ \frac{1}{16} & x = 4 \\ 0 & x > 4 \end{cases}$$



$$b) \quad P[X \geq 1 | X \leq 4] = \frac{P[1 \leq X \leq 4]}{P[X \leq 4]}$$

$$P[X \leq 4] = 1$$

$$P[1 \leq X \leq 4] = \frac{15}{16}$$

$$P[X \geq 1 | X \leq 4] = \frac{15}{16}$$

Question 2

12 engines, 3 tests, 2 nonworking engines

X random variable describing nonworking engines

$$f(x) = \frac{\binom{2}{x} \binom{12-2}{3-x}}{\binom{12}{3}}$$

$$f(1) = \frac{\binom{2}{1} \binom{10}{2}}{\binom{12}{3}} = \frac{\frac{2!}{1! \cdot 1!} \cdot \frac{10!}{2! \cdot 8!}}{\frac{12!}{3! \cdot 9!}} = \frac{9}{22}$$

$$f(2) = \frac{\binom{2}{2} \binom{10}{1}}{\binom{12}{3}} = \frac{\frac{2!}{2! \cdot 1!} \cdot \frac{10!}{1! \cdot 9!}}{\frac{12!}{3! \cdot 9!}} = \frac{1}{22}$$

$$f(1) + f(2) = \frac{9}{22} + \frac{1}{22} = \frac{10}{22} = \boxed{\frac{5}{11}}$$