1. Let,

$$f(x)=\begin{cases}\dfrac{3}{37760}x^2(20-x) & \text{if } 2\le x\le 18\\ 0 & \text{otherwise}\end{cases}$$

(a) Show that $f(x)$ is a probability density function.
(b) Find $P(X\le 7)$
(c) Find $P(X\ge 7)$
(d) Find $P(3\le X\le 14)$
(e) Determine the mean value of *X*.

2. For a brand of light bulb the probability density function of the life span of the light bulb is given by the function below, where *t* is in months.

$$f(t)=\begin{cases}0.04\mathbf{e}^{-\frac{t}{25}} & \text{if } t\ge 0\\ 0 & \text{if } t<0\end{cases}$$

(a) Verify that $f(t)$ is a probability density function.
(b) What is the probability that a light bulb will have a life span less than 8 months?
(c) What is the probability that a light bulb will have a life span more than 20 months?
(d) What is the probability that a light bulb will have a life span between 14 and 30 months?
(e) Determine the mean value of the life span of the light bulbs.

3. Determine the value of *c* for which the function below will be a probability density function.

$$f(x)=\begin{cases}c\left(8x^3-x^4\right) & \text{if } 0\le x\le 8\\ 0 & \text{otherwise}\end{cases}$$