1. For the following probability density function f given below, find $P\left(\dfrac{\pi}{3} \leq X \leq \dfrac{\pi}{2}\right)$

$$f(x) = \begin{cases} \sin(2x), & 0 \leq x \leq \frac{\pi}{2} \\ 0, & \text{otherwise} \end{cases}$$
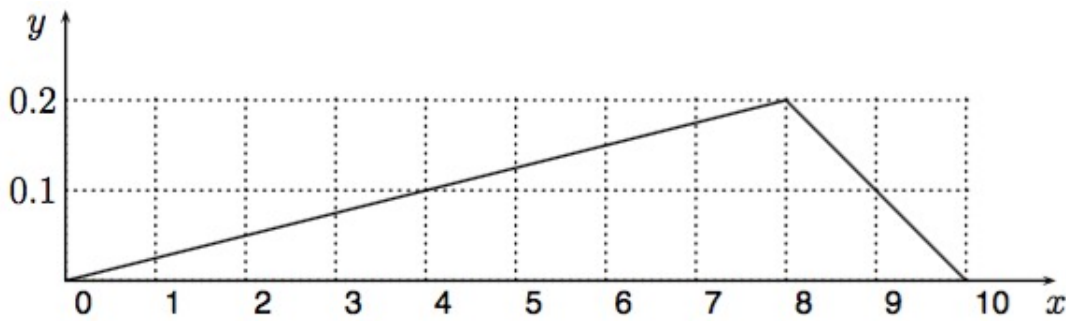
2. Given the function

$$f(x) = \begin{cases} k(4x - x^2) & 0 \leq x \leq 4 \\ 0 & \text{otherwise} \end{cases}$$

for what value of k is $f(x)$ a probability density function?

3. Find the mean of the following distribution:

$$f(x) = \begin{cases} \dfrac{2}{\sqrt{\pi}} e^{-x^2} & x \geq 0 \\ 0 & x < 0 \end{cases}$$

4. Consider the function whose graph is given below (assume it is zero for $x < 0$ and $x > 10$).

   (a) Explain why this is a probability density function

   (b) Evaluate $P(X < 4)$

   (c) Evaluate $P(4 < X < 9)$

   (d) Find the mean

   (e) Find the median

5. The function $f(x) = xe^{-x}$ for $x \geq 0$ and $f(x) = 0$ for $x < 0$ is a probability density function. Find $P(2 \leq X \leq 3)$

6. For the function

$$f(t) = \begin{cases} 0 & t < 0 \\ ce^{-ct} & t \geq 0 \end{cases}$$

   (a) Show that $f(t)$ is a probability density function

   (b) Find the mean μ in terms of c

   (c) Find the median M in terms of c