1. Let $X$ be a continuous random variable with pdf

$$f(x) = \begin{cases} x & 0 \leq x \leq 1, \\ 2 - x & 1 \leq x \leq 2, \\ 0 & \text{otherwise.} \end{cases}$$

(a) Sketch the pdf of $X$.

(b) Without computing anything, make a rough sketch of the cdf of $X$.

(c) What is $P(X \leq 1.5)$?

(d) Find a value $\eta_{0.75}$ such that $P(X \leq \eta_{0.75}) = 0.75$.

(e) Give a formula for the cdf of $X$.

2. Suppose that a continuous random variable $X$ has pdf $f(x) = kx(4 - x)$ for $0 \leq x \leq 4$, and $f(x) = 0$ otherwise.

   (a) Sketch this pdf. Then, without computing anything, make a rough sketch of the cdf of $X$.

   (b) What is the value of $k$?

   (c) Find $P(X < 1 \text{ or } X > 3)$.

3. Suppose that the cdf of a random variable $X$ is $F(x) = 1 - e^{-5x}$ for $x > 0$, and $F(x) = 0$ otherwise.

   (a) What is the pdf of $X$? Sketch both the pdf and the cdf.

   (b) What is $P\left(\frac{1}{4} < X < \frac{1}{3}\right)$? Can you get this from *either* the cdf or the pdf?

4. Random variable $X$ has pdf $f(x) = \begin{cases} ax + bx^2 & 0 < x < 1, \\ 0 & \text{otherwise.} \end{cases}$

   Furthermore, $P(X < \frac{1}{2}) = \frac{3}{16}$. What is the median of $X$?