

# Continuous Random Variables Applications

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## Exercises

1. Let  $X$  be a continuous random variable on the domain  $-k \leq X \leq k$ . Also, let  $f(x) = \frac{x^2}{18}$ .
  - a) Assume that  $f(x)$  is a valid pdf. Find the value of  $k$ .
  - b) Plot the pdf of  $X$ .
  - c) Find and plot the cdf of  $X$ .
  - d) Find  $P(X < 1)$ .
  - e) Find  $P(1.5 < X \leq 2.5)$ .
  - f) Find the 80th percentile of  $X$  (the value  $x$  for which 80% of the distribution is to the left of that value).
  - g) Find the value  $x$  such that  $P(-x \leq X \leq x) = 0.4$ .
  - h) Find the mean and variance of  $X$ .
  - i) Simulate 10000 values from this distribution and plot the density
2. Let  $X$  be a continuous random variable. Prove that the cdf of  $X$ ,  $F_X(x)$  is a non-decreasing function.  
(Hint: show that for any  $a < b$ ,  $F_X(a) \leq F_X(b)$ .)