9.5 Probability Density Function

A ______________, usually written X, is a variable whose possible values are numerical outcomes of a random phenomenon.

A _________________________ is one which takes an infinite number of possible values (usually measurements)

A _________________________ is a function f defined for all real x and having the following properties:

1.

2.

» Every continuous random variable, X, ______________________________.

» Used to determine _________________ that a continuous random variable lies between two values

$$P(a \le X \le b) =$$

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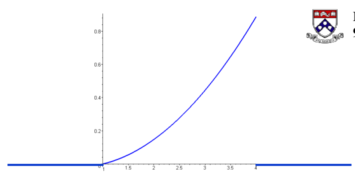
9.5 Probability

$$f(x) = \begin{cases} \frac{2}{27}x(x-1) & 1 \le x \le 4 \\ 0 & \text{otherwise} \end{cases}$$



a) Verify that f is a probability function.

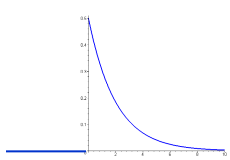
b) Find $P(2 \le x \le 3)$.

$$f(x)=\begin{cases} kx^2 & 2\le x\le 5 \\ 0 & \text{otherwise} \end{cases}$$

Find k such that $f(x)$ is a probability density function.

Exponential Density Function

$$f(x)=\begin{cases} 0 & x<0 \\ ke^{-kx} & x\ge 0 \end{cases},\ k>0$$



Examples of applications:

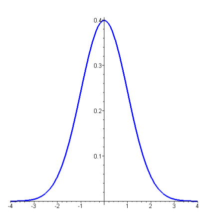
» life span of electronic components
» duration of telephone calls
» waiting time in a doctor's office
» time b/w successive flight arrivals and departures in an airport

Normal Density Function

$$f(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{-(x-\mu)^2/(2\sigma^2)}$$

$\mu =$

$\sigma =$



Mean (average value) or expected value of a probability density function is a measure of the center of a pdf.

$\mu =$

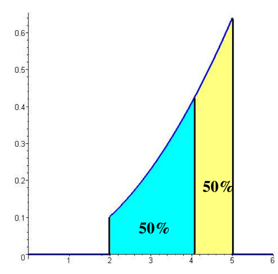
$$f(x) = \begin{cases} \frac{2}{27}x(x-1) & 1 \le x \le 4 \\ 0 & \text{otherwise} \end{cases}$$

Find the mean.

$$f(x) = \begin{cases} 0 & x < 0 \\ ke^{-kx} & x \ge 0 \end{cases}, \; k > 0$$

Find the mean.

Median (m) of a probability density function is a number such that ½ the area under the graph of f lies to the right of it.



$$f(x) = \begin{cases} \frac{1}{39}x^2 & 2 \le x \le 5 \\ 0 & \text{otherwise} \end{cases}$$

Find the median.