MATH 464
EXAMPLES OF COMMON CONTINUOUS RANDOM VARIABLES

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The following is a list of some common continuous random variables.

(1) **A Uniform Random Variable on [a,b]:** Let $[a, b] \subset \mathbb{R}$. The *uniform density* on $[a, b]$ is given by

$$f_X(x) = \begin{cases} \frac{1}{b-a} & \text{if } a \leq x \leq b \\ 0 & \text{otherwise.} \end{cases}$$

The continuous random variable X with density as given above is said to be *uniformly distributed* on $[a, b]$. Note that the range of X is $[a, b]$.

(2) **The Exponential Random Variable:** Let $\lambda > 0$. The *exponential density* with parameter $\lambda > 0$ is given by

$$f_X(x) = \begin{cases} \lambda e^{-\lambda x} & \text{if } x \geq 0 \\ 0 & \text{if } x < 0. \end{cases}$$

The continuous random variable X with density as given above is said to have an *exponential distribution* with parameter $\lambda > 0$. Note that the range of X is $[0, \infty)$.

(3) **The Normal Random Variable:** Let $\mu > 0$ and $\sigma > 0$ be given. The *normal density* with parameters μ and σ is given by

$$f_X(x) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left[-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2\right] \quad \text{for all } x \in \mathbb{R}\,.$$

The continuous random variable X with density as given above is said to have a *normal distribution* with parameters μ and σ. Note that the range of X is $(-\infty, \infty)$.

(4) **The Cauchy Random Variable:** The *Cauchy density* is given by

$$f_X(x) = \frac{1}{\pi(1+x^2)} \quad \text{for all } x \in \mathbb{R}\,.$$

The continuous random variable X with density as given above is said to have a *Cauchy distribution*. Note that the range of X is $(-\infty, \infty)$.