Chapter 4

Continuous Random Variables

Weibull RV

The Weibull rv X with parameters α>0 and β>0 is the rv with the pdf (for x≥0)

$$f(x;\alpha,\beta)=\frac{\alpha}{\beta^{\alpha}}x^{\alpha-1}e^{-(x/\beta)^{\alpha}}$$

Expectation and Variance of the Weibull RV

If X is a Weibull rv with parameters α and β, then

$$E(X)=\beta\Gamma(1+\alpha^{-1})$$

$$V(X)=\beta^2\{\Gamma(1+2\alpha^{-1})-(\Gamma(1+\alpha^{-1}))^2\}$$

$$F(x;\alpha,\beta)=1-e^{-(x/\beta)^{\alpha}} \text{ for } x\geq 0$$

Example

Let X denote the amount of NO_x emission (g/gal) from a randomly selected four-stroke engine of a certain type. Suppose that X has a Weibull distribution with α=2 and β=10.

What is the probability that X is

- at most 20?

- more than 40?

Lognormal RV

A nonnegative rv X is said to be a lognormal rv with parameters μ and σ>0 if ln(X) is a normal rv with parameters μ and σ.

Expectation and Variance of the Lognormal RV

If X is a lognormal rv with parameters μ and σ, then

$$E(X)=e^{\mu+\sigma^2/2}$$

$$V(X)=e^{2\mu+\sigma^2}(e^{\sigma^2}-1)$$

Example

In 6 months from today, a stock price is assumed to have a lognormal distribution with parameters $\mu=3.759$ and $\sigma=0.141$.

- Find the mean and the variance of the stock price

- Find an interval such that the probability that the stock price lies in that interval is 0.95