Beta Distribution

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1 What is Beta Distribution

The *beta function* (also known as *Euler's integral of the first kind*) is important in calculus and analysis due to its close connection to the gamma function, which is itself a generalization of the factorial function. Many complex integrals can be reduced to expressions involving the beta function.

1.1 Definition

The *beta function*, denoted by $B(x, y)$, is defined as

$$B(x,y) = \int_0^1 t^{x-1}(1-t)^{y-1}dt$$

this is also the Euler's integral of the first kind.

1.2 Featues

Symmetry Symmetry of the Beta Function

$$B(x,y) = B(y,x)$$

Gamma Function We have

$$B(x,y) = \frac{\Gamma(x)\Gamma(y)}{\Gamma(x+y)}$$

thus for positive integrals x and y, we can define the *Beta function* as

$$B(x,y) = \frac{(x-1)!(y-1)!}{(x+y-1)!}$$

Proof. proof. □

Theorem 1.1. *theorem.*

Lemma 1.1. *lemma.*