

## 1 Algebra

### Absolute Value Inequalities

$$|f(x)| < a \Rightarrow -a < f(x) < a.$$

$$|f(x)| > a \Rightarrow f(x) > a \text{ or } f(x) < -a$$

## 2 Important probability distributions

### Bernoulli

### Exponential

### Gaussian

### Poisson

### Uniform

## 3 Expectation and Variance

### Expectation

### Variance

### Covariance

### Variance and expectation of mean of n iid random variables

Let  $X_1, \dots, X_n \stackrel{iid}{\sim} P_\mu$ , where  $E(X_i) = \mu$  and  $Var(X_i) = \sigma^2$  for all  $i = 1, 2, \dots, n$  and  $\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i$ .

Variance of the Mean:

$$Var(\bar{X}) = \left(\frac{\sigma^2}{n}\right)^2 Var(X_1 + X_2, \dots, X_n) = \frac{\sigma^2}{n}.$$

Expectation of the mean:

$$E[\bar{X}] = \frac{1}{n} E[X_1 + X_2, \dots, X_n] = \mu.$$

## 4 Law of large Numbers

## 5 Central Limit theorem

## 6 Statistical models

## 7 Confidence intervals

### Onesided

### Twosided

### Delta Method

## 8 Hypothesis tests

### Onesided

### Twosided

### P-Value