Quantitative Finance integrates Mathematics, Statistics, and Computer Science with the objective of practical application towards financial markets. One of the primary concerns of quantitative finance is risk. Some of the primary concerns of Quantitative Finance include:

- The pricing of securities, especially derivative securities
- Risk

A large amount of work in quantitative finance relies on the following two assumptions:

- Markets are efficient
- There is no free lunch (no arbitrage assumption)

Two common approaches to the pricing of derivatives are the **risk-neutral** pricing framework and the **differential equations** approach. Binomial Trees are an example of risk-neutral pricing, and the Black-Scholes equation is an application of partial differential equations.

The differential equations approach often leads to closed-form solutions, leading to straight-forward pricing formulas such as the Black-Scholes formula. These are referred to as analytical solutions. In other cases, differential equations have no known analytical solution, and thus must be solved numerically. For instance, there is no closed-form solution for the price of an American Put option; though solving for the price of an American Put numerically is not computationally intense.

The risk-neutral approach can also entails use of **stochastic calculus**. While analytical solutions are possible, numerical solutions are more common in the risk-neutral approach. The risk-neutral approach is more flexible than the differential equations approach and can be used to price derivitives that cannot be valued using differential equations or Black-Scholes.

Stochastic calculus often requires a "change of measure" between the "real world" of probabilities and the "risk-neutral world" of probabilities.