COURSE DESCRIPTION
MAT16A

MAT16A is an Introduction to Differential Calculus for non-engineering majors. Differential Calculus is the theory of the *derivative*, which is the foundation of modern science and engineering.

Why? Because the fundamental laws of science and engineering almost always come to us stated in terms of rates of change; and the *derivative* is nothing more nor less than the mathematical definition of *a rate of change.*

For example, Newton's fundamental law of physics is

$$Force = Mass \times Acceleration.$$

It states that an object with a given mass or weight will respond to an applied force by accelerating according to Newton's law. Since acceleration is the *rate of change of velocity with respect to time*—a rate of change and hence a *derivative*—Newton's fundamental force law comes to us stated in terms of a rate of change. To predict the motion of a sportscar or a rocket ship or a tadpole, starting with the "horsepower" (force) of its engine, one starts with Newton's fundamental law which provides an equation for its acceleration (a *derivative*)–and the mathematical problem is then to solve the equation and graph the motion.

The same is true throughout science and engineeriing: whether its a rate law in Chemistry or a growth law in Population Dynamics, the fundamental law, the starting point if you will, almost always comes to us stated in terms of a rate of change–that is why *derivatives* are fundamental to science.

MAT16A Short Calculus is the theory of the *derivative.* The ideas come to us from Isaac Newton and Gottfreid Leibniz who invented the subject (independently) in the late seventeenth century. The notation of Newton was discarded centuries ago, and everyone, including our text book, has embraced the notation of Leibniz. The Leibniz notation is an act of genius in its own right, and where once only the smartest people alive could understand calculus, thanks to Leibniz's notation, the subject can be understood by anyone who learns this notation and completes this class!

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