

## Summary of Paul Foerster's Workshop for Houston Area Calculus Teachers, 2/24/18

### Title: Definite Integrals—Concept, Definition, Evaluation, and Applications

In this workshop you will investigate classroom-developed Explorations by which the presenter's students master the concept of definite integral. At the beginning of the course students learn that calculus involves just four major concepts: limits, derivatives, and two concepts called "integrals." After an exposure, numerically and graphically, to limits and derivatives on the first two days of the course, students discover the definite integral, also graphically and numerically. This approach conveys the concept of definite integral without distracting students with the analytical procedures they will eventually learn. You will see how students can explore accurate graphs to discover the intricacies of the mean value theorem, and how that theorem is used to prove the fundamental theorem. The fundamental theorem allows them to calculate definite integrals exactly, using indefinite integrals, and also explains why two different concepts share the same name. Understanding that a definite integral is the limit of a sum helps students apply the concept to things like volumes of solids as length times cross-sectional area, where that cross-sectional area varies. You will also see how to motivate other applications where the definite integral is an accumulated rate of change of a function, as they will be asked to do on the AP Exams. If you bring a thumb drive and a TI-84 calculator, you can download copies of the Explorations, their solutions, and some relevant calculator programs.

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