Teaching Rates of Change from Algebra to Calculus

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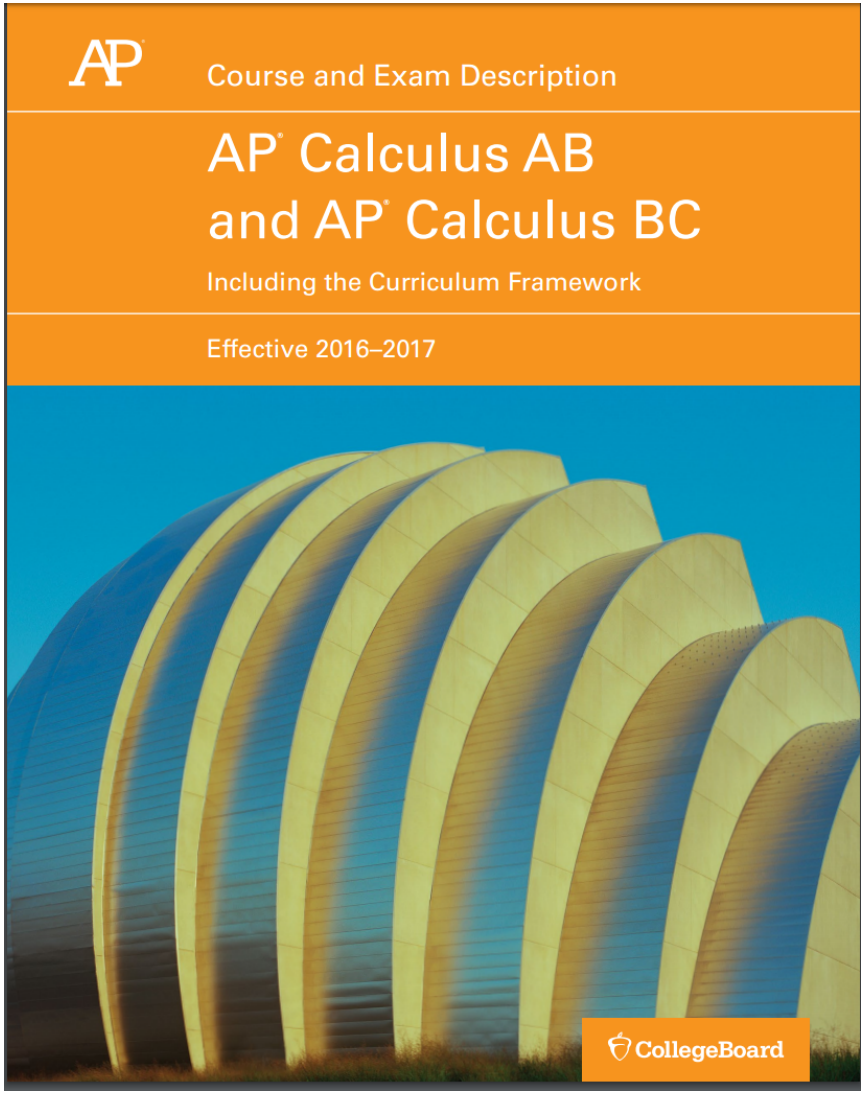
Course and Exam Description

https://advancesinap.collegeboard.org/stem/calculus



The Concepts

Big Idea 1:	Limits
Big Idea 2:	Derivatives
Big Idea 3:	Integrals and the Fundamental Theorem of Calculus
Big Idea 4:	Series (BC)

Pages 8-10

MPACs

MPAC 1:	**Reasoning with definitions and theorems**
MPAC 2:	**Connecting concepts**
MPAC 3:	**Implementing algebraic/computational processes**

Pages 8-10

MPAC 4: Connecting multiple representations

MPAC 5: Building notational fluency

MPAC 6: Communicating

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MPAC 2:
Connecting Concepts

Where do students have opportunities to connect concepts before calculus?

- connect concepts to their visual representations with and without technology;
- compare rates of change in tables, graphs, and equations;
- connect proportional relationships to unit rates;
- connect rate of change to slope.

Opportunities to make connections: Rates (Ask purposeful questions.)

- What is the difference between instantaneous rate of change and average rate of change?
- How are the two concepts connected?
- Give an example of each using a graph, a table, and an algebraic function.
- Explain what each of these representations mean.

$$\frac{f(b)-f(a)}{b-a};\ \lim_{x\to a}\frac{f(x)-f(a)}{x-a}$$

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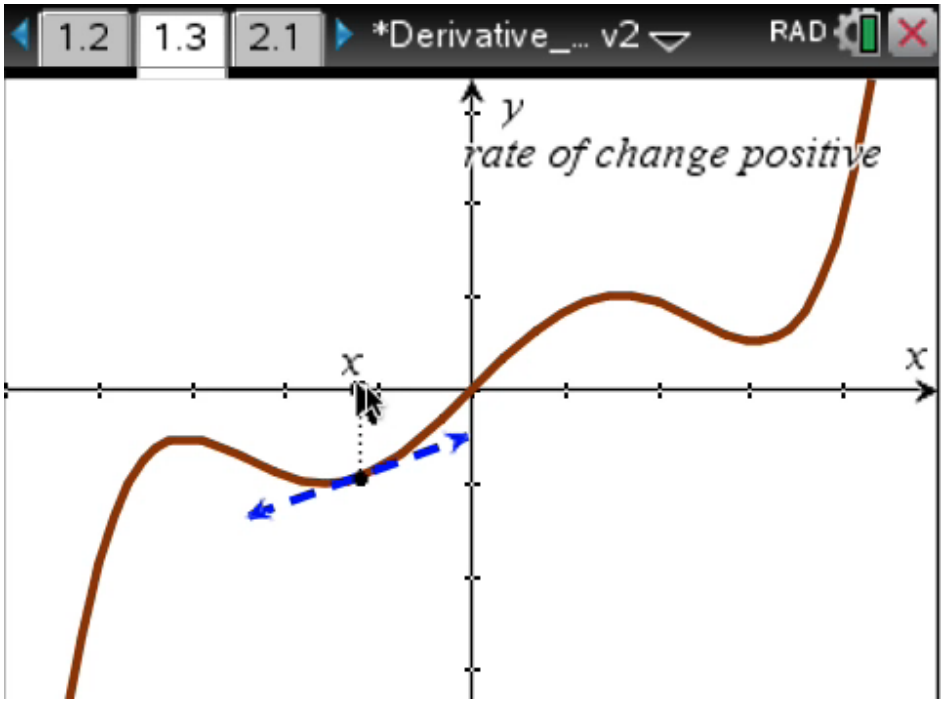
MPAC 4:
Connecting multiple representations

Where do students have opportunities to connect multiple representations before calculus?

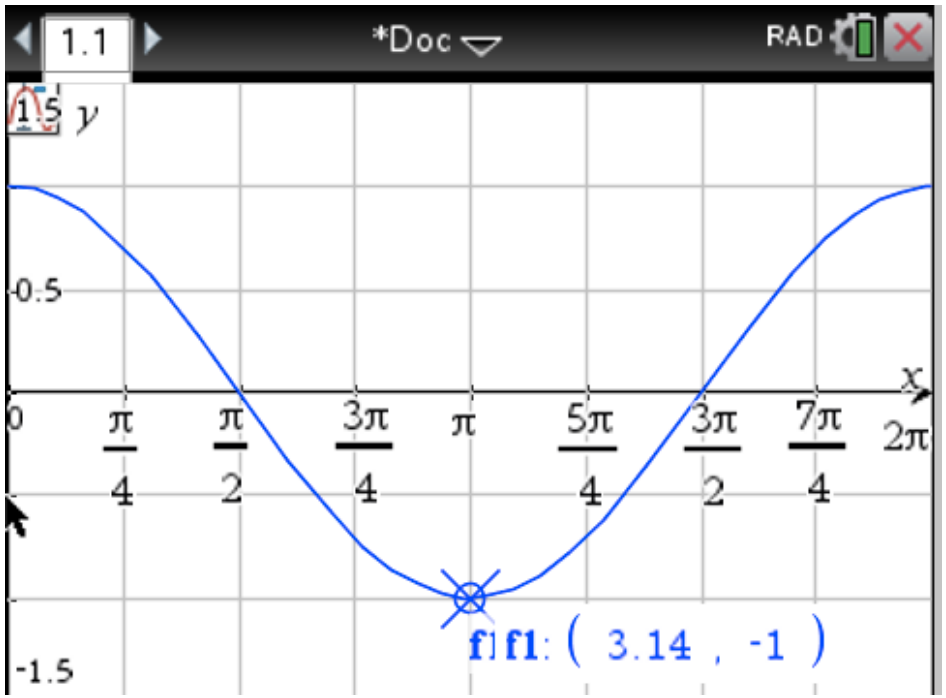
- associate tables, graphs, and symbolic representations of functions;
- develop concepts using graphical, symbolical, or numerical representations with/without technology;
- identify how mathematical characteristics of functions are related in different representations;
- extract and interpret mathematical content from any presentation of a function
- construct one representational form from another

Opportunities to connect words and graphs in calculus



Calculus Nspired: Derivative Analysis

Given the following graph of $f(\theta) = \cos\theta$, at what angle measure do the output values of f change from increasing at an increasing rate to increasing at a decreasing rate?



Teaching Rates of Change

- Connecting Ratios to Equations – Building Concepts – Middle Grades
- Rate of Change – Math Nspired – Algebra 1 – Linear Functions
- ?The Variables of Renting – 84 Activity Central – Middle Grades Math – Functions
- ?Slope of a Secant –
- ?Slope of a Tangent –
- Derivative Analysis – Math Nspired – Calculus – Applications of the Derivative
- ?Slope Fields or MVT