Calculus

Limits

Graphically

Numerically

Analytically

Derivatives/ Differentiation

Applications of Derivatives

Implicit Differentiation

Slope Field

Integrals/ Antiderivatives

Applications of Integrals

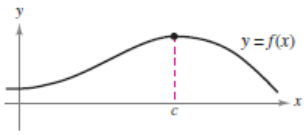
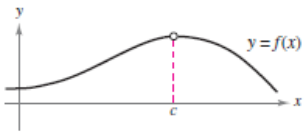
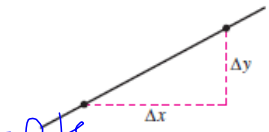
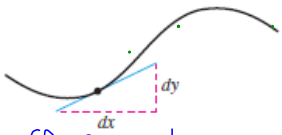
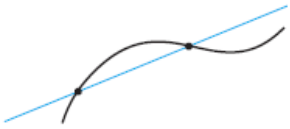
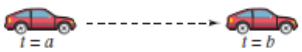
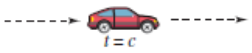
Solids of Revolution

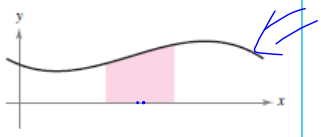
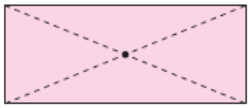
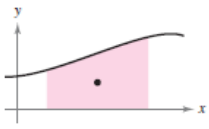
1 Limits and Their Properties

- Compare precal and calculus 1.1
- Find limits: Graphically, numerically and analytically 1.2 & 1.3
- Continuity 1.4
- One sided limits 1.4
- Infinite Limits 1.5
- Limits going to infinity 3.5

1.1 A Preview of Calculus

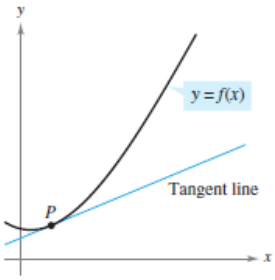
Objective: Given the Classical Problems of calculus students will be able to compare calculus and pre calculus.

Without Calculus	With Differential Calculus
Value of $f(x)$ when $x = c$ 	Limit of $f(x)$ as x approaches c 
Slope of a line  m at 2 pts	Slope of a curve  m : at one pt
Secant line to a curve 2 pts 	Tangent line to a curve 1 pt
Average rate of change between $t = a$ and $t = b$ 	Instantaneous rate of change at $t = c$ 

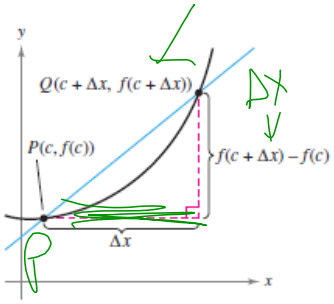
Without Calculus		With Integral Calculus	
Area of a rectangle		Area under a curve	
Work done by a constant force		Work done by a variable force	BC
Center of a rectangle	 A	Centroid of a region	 BC
Length of a line segment	B	Length of an arc	A B BC
Surface area of a cylinder		Surface area of a solid of revolution	AB

Ch 7

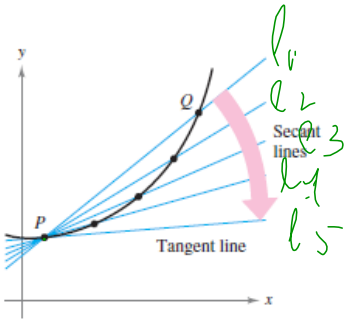
The Tangent Line Problem



The tangent line to the graph of f at P
Figure 1.1



(a) The secant line through $(c, f(c))$ and $(c + \Delta x, f(c + \Delta x))$



(b) As Q approaches P, the secant lines approach the tangent line.

$\Delta x \to 0$

0.000000000 1

Pg 45

EXPLORATION

The following points lie on the graph of $f(x) = x^2$.

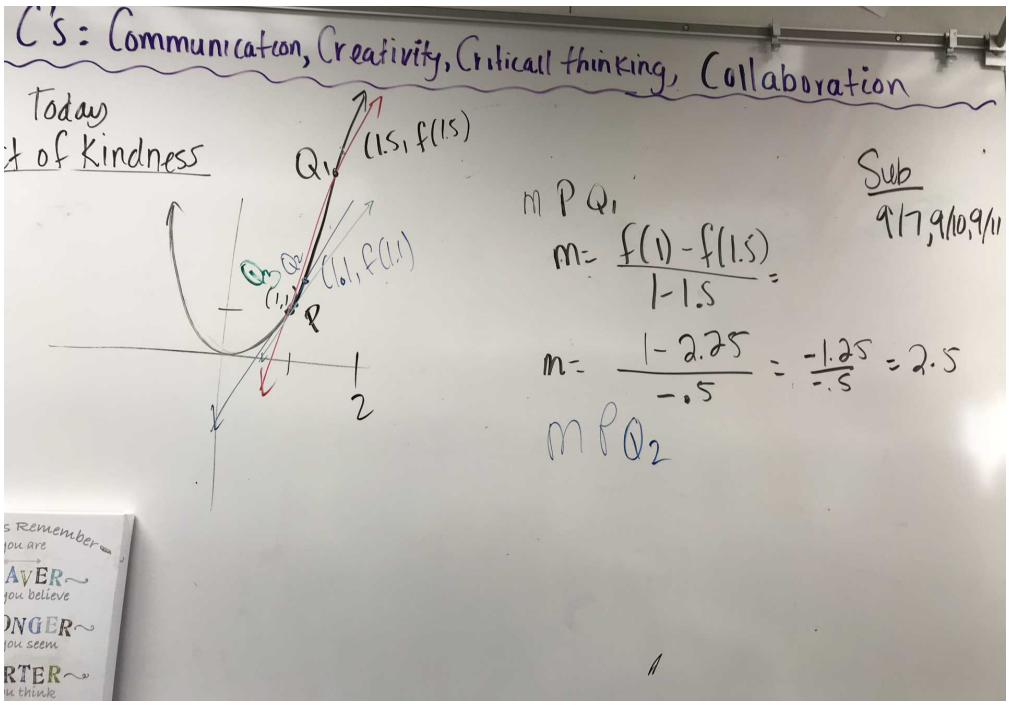
$Q_1(1.5, f(1.5))$, $Q_2(1.1, f(1.1))$, $Q_3(1.01, f(1.01))$,

$Q_4(1.001, f(1.001))$, $Q_5(1.0001, f(1.0001))$

Each successive point gets closer to the point $P(1, 1)$. Find the slopes of the secant lines through Q_1 and P, Q_2 and P, and so on. Graph these secant lines on a graphing utility. Then use your results to estimate the slope of the tangent line to the graph of f at the point P.

How you find the slope of the lines?

How do you find the equation of the secant lines?

How do you get a better estimate of the slope of the tangent line?

The precise slope at p is called the derivative at P for f(x)