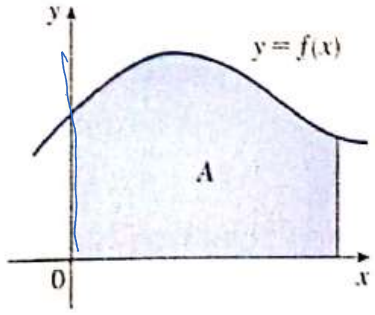
To the Student

Reading a calculus textbook is different from reading a story or a news article. Don't be discouraged if you have to read a passage more than once in order to understand it. You should have pencil and paper and calculator at hand to sketch a diagram or make a calculation.

Some students start by trying their homework problems and read the text only if they get stuck on an exercise. We suggest that a far better plan is to read and understand a section of the text before attempting the exercises. In particular, you should look at the definitions to see the exact meanings of the terms. And before you read each example, we suggest that you cover up the solution and try solving the problem yourself.

Part of the aim of this course is to train you to think logically. Learn to write the solutions of the exercises in a connected, step-by-step fashion with explanatory sentences—not just a string of disconnected equations or formulas.

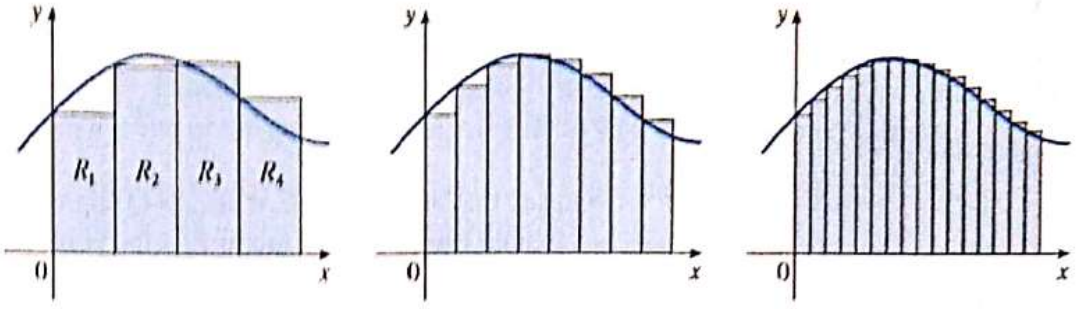
Area problem - Integral



Find A = Area under the curve

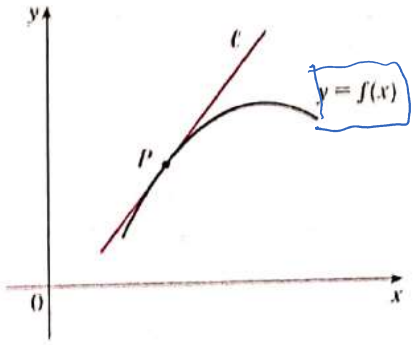
$A_n = R_1 + R_2 + \cdots + R_n$

$A = \lim_{n \to \infty} A_n$



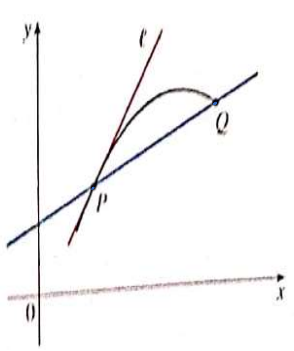
Tangent problem

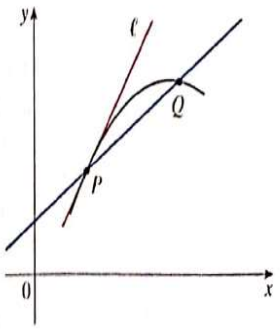
Find the equation of the tangent at the point P

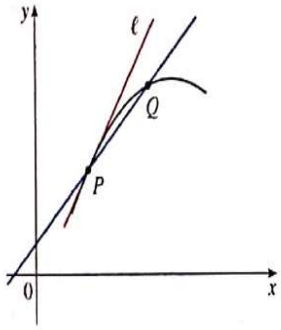


slope of secant line PQ

m_{PQ}

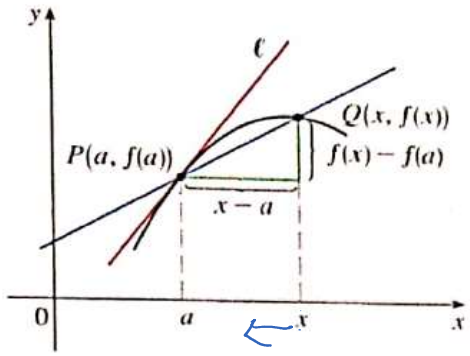






Q can move along the curve towards P

The secant line approaches the tangent line as Q approaches P



$$m = \lim_{Q \to P} m_{PQ}$$

slope of the secant line

m is slope of tangent line ℓ

$$m_{PQ} = \frac{f(x) - f(a)}{x - a}$$

$$m = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$

definition of the derivative

Fundamental Theorem of Calculus

Area problem $\longleftrightarrow$ Tangent problem

$$g(x) = \int_a^x f(t)\,dt$$

where $g'(x) = f(x)$