

## Chapter 2. Limits and Continuity

### 2.1. Rates of Change and Limits

**Definition.** The *average rate of change* of  $y = f(x)$  with respect to  $x$  over the interval  $[x_1, x_2]$  is

$$\frac{\Delta y}{\Delta x} = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{f(x_1 + h) - f(x_1)}{h}$$

where  $h = x_2 - x_1$ .

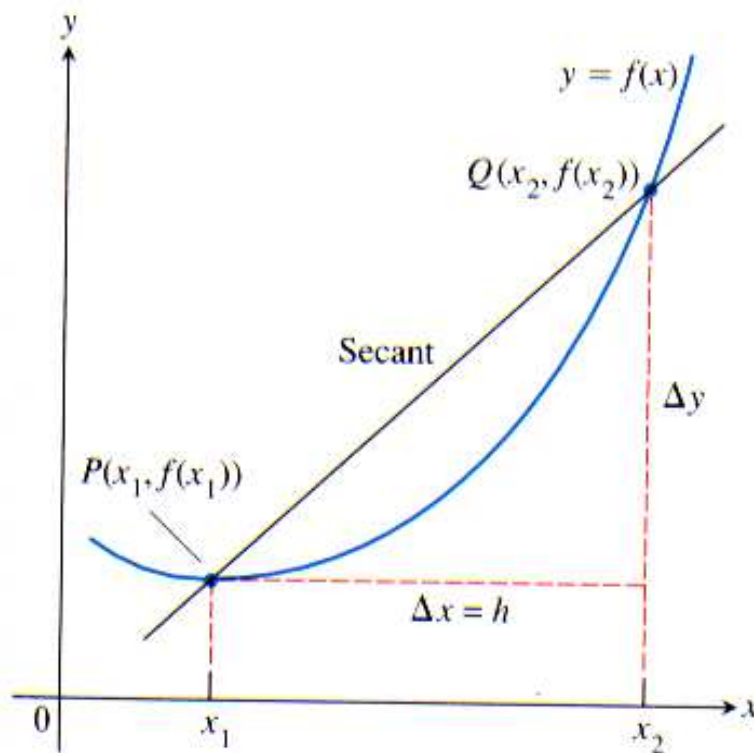


Figure 2.1, page 69

**Example.** Page 77 number 32a.

**Definition. Informal Definition of Limit.**

Let  $f(x)$  be defined on an open interval about  $x_0$ , **except possibly at  $x_0$  itself**. If  $f(x)$  gets arbitrarily close to  $L$  for all  $x$  sufficiently close to  $x_0$ , we say that  $f$  *approaches the limit  $L$  as  $x$  approaches  $x_0$* , and we write

$$\lim_{x \rightarrow x_0} f(x) = L.$$

**Note.** The above definition is **informal** (that is, it is not mathematically rigorous) since the terms “arbitrarily close” and “sufficiently close” are not defined.

**Example.** Page 75 number 2.

**Example.** Page 76 number 12.

**Example.** Page 72, Example 6.

**Example.** Page 77 number 24.