Chapter 2. Limits and Continuity

2.7 Tangents and Derivatives

Definition. Slope and Tangent Line.

The *slope of the curve* $y = f(x)$ at the point $P(x_0, f(x_0))$ is the number

$$m = \lim_{h \to 0} \frac{f(x_0 + h) - f(x_0)}{h},$$

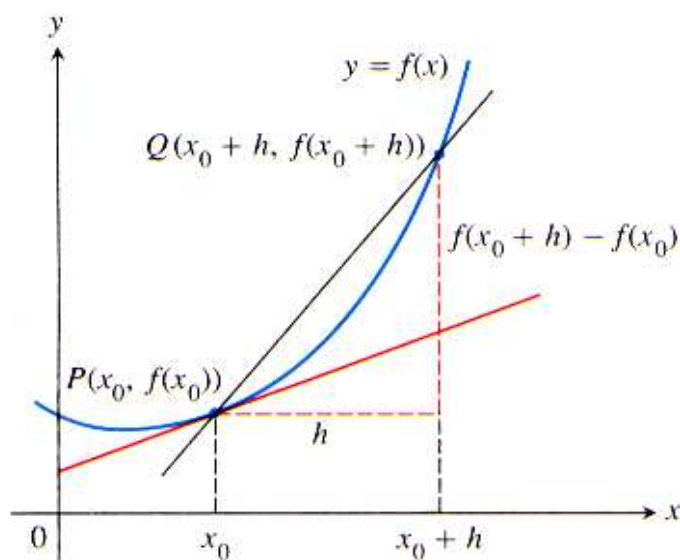provided the limit exists. The *tangent line* to the curve at P is the line through P with this slope.

Figure 2.71, page 133

Example. Page 136 number 7.

Definition. If $f(t)$ is the position of a particle at time t, then the instantaneous rate of change of position with respect to time (i.e. the *instantaneous velocity*) is

$$\lim_{h \to 0} \frac{f(t+h) - f(t)}{h},$$

provided the limit exists.

Example. Page 137 number 28.

Example. Page 137 number 24.