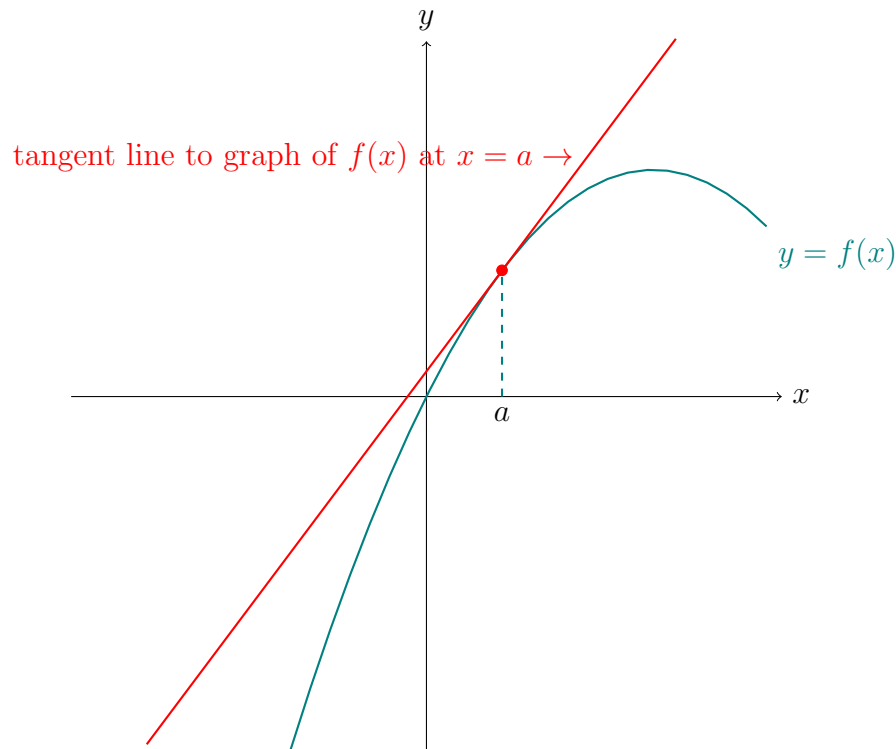# Tangent Lines: The Slope of a Graph at a Point

Video companion
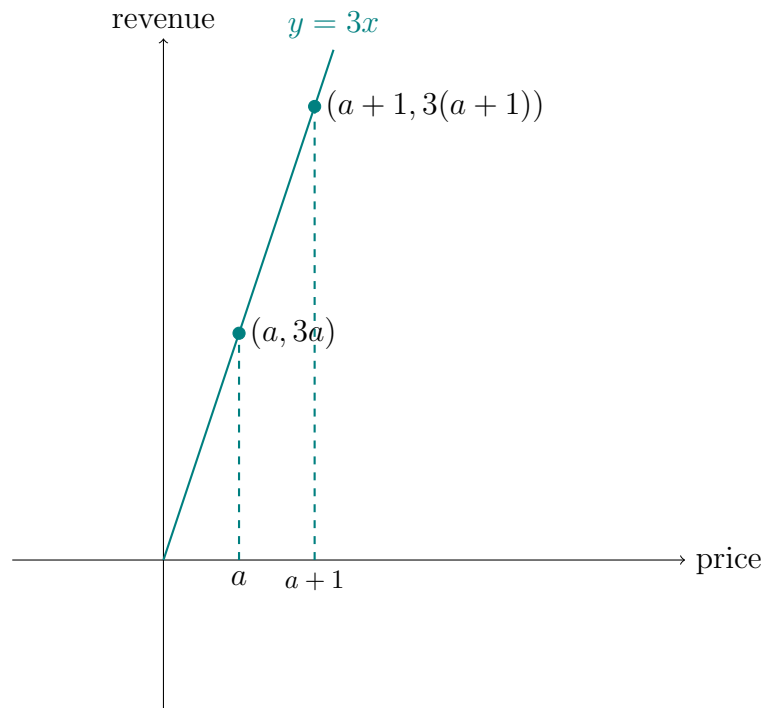
1   Introduction

Question: How fast is $f(x)$ changing at $x = a$?

The slope of the *tangent line* gives the instantaneous rate of change. This is also called the *derivative* of the function at that point, or $f'(a)$.

Limit to find slope at $x = a$:

$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$
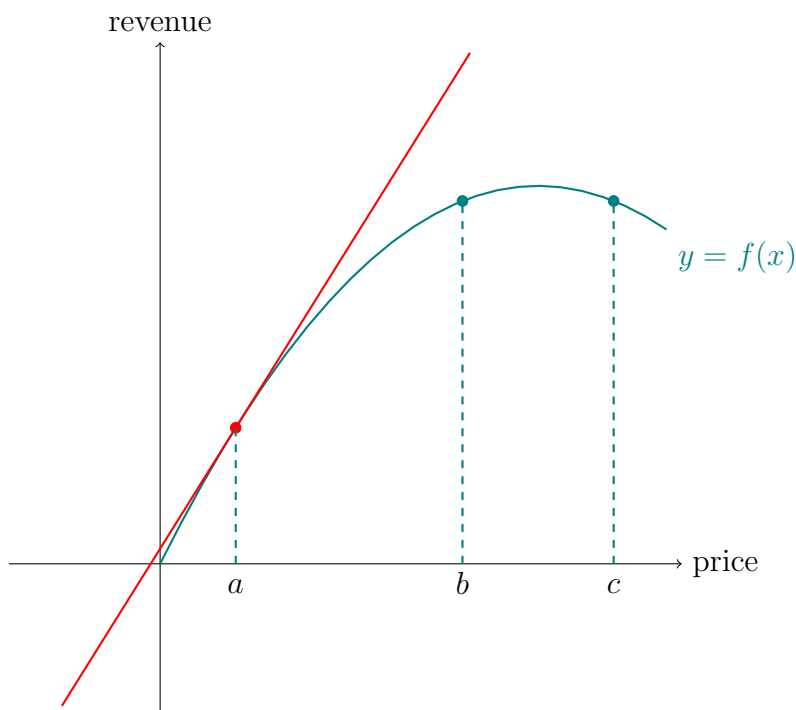
2   Simple example

Slope:

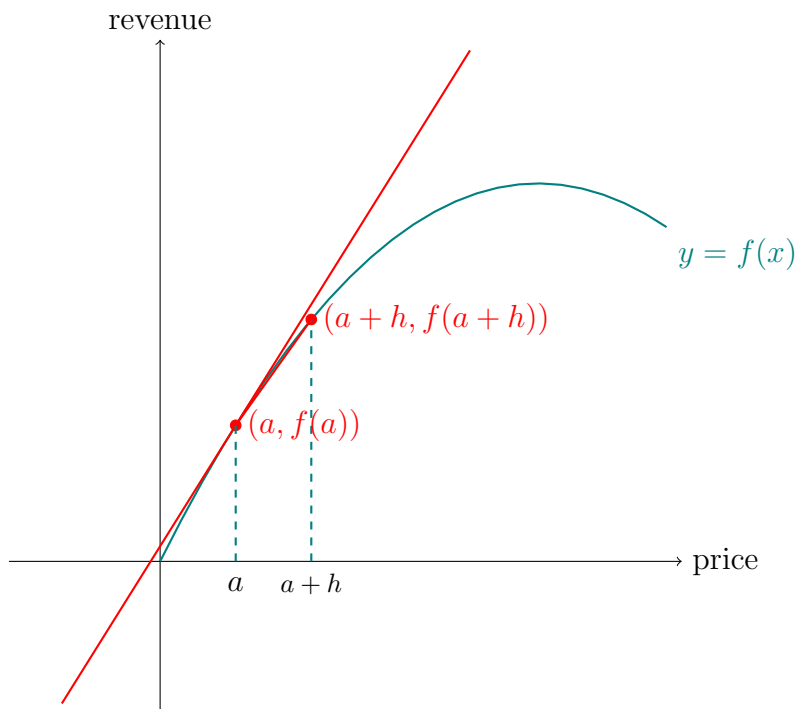$$\frac{3(a+1) - 3a}{a + 1 - a} = 3$$

3 More realistic example

What is the instantaneous rate of change of revenue at a price point? It depends on the slope of the tangent line, which changes depending on the price point.

The answer is the slope, or derivative of the function at the price value $x = a$: $f'(a)$.

Related question: What is the slope of a line segment through a and another point on the line?

Slope of line from a to $a + h$:

$$\frac{f(a + h) - f(a)}{h}$$

Slope of tangent line at $x = a$:

$$f'(a) = \lim_{h \to 0} \frac{f(a + h) - f(a)}{h}$$

This is calculus.