

MATH PREREQUISITES

The course assumes that students are familiar with high-school mathematics as well as with AP Calculus. The following exercises provide a sample of the calculus tools used throughout the course. To this one must add the high-school math tools described in the Microeconomics with Algebra math prerequisites pages.

■ **1. Derivatives of one-variable functions.** Find the derivatives of the following functions with respect to x .

$$(a) y = 2x + 27$$

Answer: 2

$$(b) y = 2x^2 + 3x + 27$$

Answer: $4x + 3$

$$(c) y = (x - 2)(2x + 7)$$

Answer: $4x + 3$

$$(d) 3x^8 + 13$$

Answer: $24x^7$

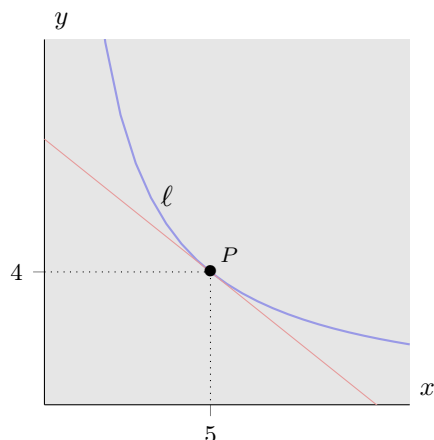
■ **2. Derivatives of multiple-variable functions.** Suppose that $y = x^{1/3} z^{4/3}$. Find the partial derivative of y with respect to x and the partial derivative of y with respect to z .

Answer:

$$\frac{\partial y}{\partial x} = \frac{1}{3} x^{(1/3-1)} z^{4/3} = \frac{1}{3} x^{-2/3} z^{4/3}$$

$$\frac{\partial y}{\partial z} = \frac{4}{3} x^{1/3} z^{(4/3-1)} = \frac{4}{3} x^{1/3} z^{1/3}$$

■ **3. Tangent lines.** Consider the graph below. Determine the equation of the tangent to the blue line ℓ at point $P = (5, 4)$, knowing that ℓ is described by the equation $y = 20/x$.



Answer: The derivative of y with respect to x along ℓ is given by $-20/x^2$. At point P , this becomes $-20/5^2 = -4/5$. It follows that the tangent has slope $-4/5$. Moreover, it goes through point $(5,4)$. Therefore, the equation describing the tangent is given by

$$y - 4 = -\frac{4}{5}(x - 5)$$

or simply

$$y = 8 - \frac{4}{5}x$$