

Exercise 1 Differentiate the function.

(a) $f(x) = e^5$

(b) $H(u) = (3u - 1)(u + 2)$

(c) $y = x^{5/3} - x^{2/3}$

(d) $y = \sqrt[3]{x}(2 + x)$

(e) $y = \frac{\sqrt{x} + x}{x^2}$

(f) $k(r) = e^r + r^e$

(g) $D(t) = \frac{1 + 16t^2}{(4t)^3}$

Exercise 2 Find an equation of the tangent line to the curve of $y = x - \sqrt{x}$ at the point $P(1, 0)$. Illustrate by graphing the curve and the tangent line on the same screen.

Exercise 3 The equation of motion of a particle is $s = t^4 - 2t^3 + t^2 - t$, where s is in meters and t is in seconds.

- (a) Find the velocity and acceleration as functions of t .
- (b) Find the acceleration after 1 second.
- (c) Graph the position, velocity, and acceleration functions on the same screen.

Exercise 4 For what value of x does the graph of $f(x) = e^x - 2$ have a horizontal tangent?

Exercise 5 The equation $y'' + y' - 2y = x^2$ is called a **differential equation** because it involves an unknown function y and its derivatives y' and y'' . Find constants A , B , and C such that the function $y = Ax^2 + Bx + C$ satisfies this equation.

Exercise 6 At what numbers is the following function g differentiable?

$$g(x) = \begin{cases} 2x & \text{if } x \leq 0 \\ 2x - x^2 & \text{if } 0 < x < 2 \\ 2 - x & \text{if } x \geq 2 \end{cases}$$

Give a formula for g' and sketch the graphs of g and g' .