

---

## Sections 3.2-3.3

---

**Exercise 1.** Find the derivatives of the following functions:

1.  $f(x) = x^4 + 2\sqrt{5x} - \frac{1}{x} + \frac{4}{x^3\sqrt{x}} - 7\sqrt[3]{x^2} + \pi^5.$

2.  $g(x) = (x + \sqrt{x} - 7)(3x^2 - 5x + 2).$

3.  $j(x) = (x^6 + x^3 - 1)(x^8 - x^4 + 1).$

4.  $k(x) = \frac{x^2 - 2x + 5}{x^2 + \sqrt{x}}.$

5.  $m(x) = \frac{x^6 + 6x}{x^3 + \pi^3}.$

**Exercise 2.** Find an equation of the tangent line to the curve  $y = x^{2/5}$  at the point  $(32, 4).$

**Exercise 3.** Find an equation to the curve  $y = \frac{1 - y^2}{1 + y^2}$  that is parallel to  $-3x + 25y = 1.$

**Exercise 4.** Given the parabola

$$y = x^2 - 4x + 5$$

Find the equations of the tangent lines that pass through the point  $(1, -7)$

**Exercise 5.** Given  $f$  and  $g$  2 differentiable functions on  $[0,5].$

Suppose that

$$f(3) = 4, \quad f'(3) = -2, \quad g(3) = -5, \quad g'(3) = 7.$$

Find the derivative at  $x = 3$  of the functions

$$(2x^3 + 5)g(x); \quad \frac{(f(x) - g(x))}{x + 5}; \quad (f(x) - 4)(g(x) - 7).$$

**Exercise 6.** Given the function

$$g(x) = \begin{cases} -1 - 2x & \text{for } x < -1 \\ x^2 & \text{for } -1 \leq x \leq 2 \\ x^3 + a(x - 2) - 4 & \text{for } x > 2 \end{cases}$$

1. Is the function  $g$  differentiable at  $x = -1$
2. Determine the value of  $a$  for which  $g$  is differentiable at  $x = 2.$

**Exercise 7.** The position of a particle at time  $t$  (in second) is given by the function  $x(t) = \frac{t - 2}{t^2 - 4t + 5}$

1. Find the velocity at time  $t.$
2. When is the particle at rest?
3. When is the particle moving in the positive direction?
4. What is the distance traveled by the particle during the first 4 seconds.