

# Sections 2.3-2.4: Differentiation Techniques

Find  $\frac{dy}{dx}$ .

1.  $y = 4x^7$

3.  $y = 3x^8 + 2x + 1$

5.  $y = \pi^3$

7.  $y = -\frac{1}{3}(x^7 + 2x - 9)$

Find  $f'(x)$ .

9.  $f(x) = x^{-3} + \frac{1}{x^7}$

11.  $f(x) = -3x^{-8} + 2\sqrt{x}$

13.  $f(x) = x^e + \frac{1}{x^{\sqrt{10}}}$

15.  $f(x) = \sqrt[3]{\frac{8}{x}}$

23. For  $y = (1-x)(1+x)(1+x^2)(1+x^4)$  find  $\left.\frac{dy}{dx}\right|_{x=1}$ .

39. Find an equation of the tangent line to the graph of  $y = f(x)$  at  $x = -3$  if  $f(-3) = 2$  and  $f'(-3) = 5$ .

47. Show that  $y = x^3 + 3x + 1$  satisfies  $y''' + xy'' - 2y' = 0$ .

59. Show that the triangle that is formed by any tangent line to the graph of  $y = \frac{1}{x}$ ,  $x > 0$ , and the coordinate axes has an area of 2 square units.

7. Find  $f'(x)$  of  $(x^3 + 7x^2 - 8)(2x^{-3} + x^{-4})$  by first using the product rule, then by multiplying out and using the power rule.

Find  $f'(x)$ .

13.  $f(x) = \frac{x^2}{3x-4}$

15.  $f(x) = \frac{(2\sqrt{x}+1)(x-1)}{x+3}$

17.  $f(x) = (2x+1)\left(1+\frac{1}{x}\right)(x^{-3}+7)$

21. Find  $\left.\frac{dy}{dx}\right|_{x=1}$  of  $y = \frac{2x-1}{x+3}$ .

25. Use a graphing calculator to find  $f'(1)$  of  $f(x) = \frac{x}{x^2+1}$ , then compare your answer to the value obtained by differentiating by hand.

Find all values of  $x$  at which the tangent line to the given curve satisfies the stated property.

33.  $y = \frac{x^2+1}{x+1}$ ; parallel to the line  $y = x$

35.  $y = \frac{1}{x+4}$ ; passes through the origin

37. a. What should it mean to say that two curves intersect at right angles?

b. Show that the curves  $y = \frac{1}{x}$  and  $y = \frac{1}{2-x}$  intersect at right angles.