

## Differentiation Practice

Find the derivative of each of the following functions by applying the Chain Rule:

1.  $y = (2x + 1)^5$

2.  $y = (4 - 3x)^4$

3.  $y = (x^2 + 1)^{-3}$

4.  $y = x + \sqrt{x}^{-2}$

5.  $y = \left(1 - \frac{x}{2}\right)^{-10}$

6.  $y = \left(\frac{x}{5} + \frac{1}{5x}\right)^5$

7.  $y = \left(\frac{x^2}{8} + x - \frac{1}{x}\right)^4$

8.  $y = \frac{1}{\sqrt[5]{3 - 2x^3}}$

9.  $y = \sqrt[3]{x^2 + 3x}$

10.  $y = (1 - 6x)^{2/3}$

11.  $y = (3x + 5)^{-1/2}$

12.  $y = \sqrt{1 - \sqrt{x}}$

13.  $y = \sqrt{x + \sqrt{x}}$

14.

15.  $y = \sqrt{1 - e^x}$

16.  $y = \sqrt[3]{2x + e^{3x}}$

17.  $y = e^{-\frac{1}{x}}$

18.  $y = e^{x+e^x}$

Find derivatives of the following by applying the Chain Rule with the Product Rule or Quotient Rule.

19.  $y = x\sqrt{1-x^2}$

20.  $y = \frac{x}{\sqrt{x^2+1}}$

21.  $y = x^3(2x-5)^4$

22.  $y = (1-x)(3x^2-5)^5$

23.  $y = x \cdot 2^{3x}$

24.  $y = \frac{e^{-x^2}}{x}$

25.  $y = \left(\frac{x}{x-1}\right)^2$

26.  $y = xe^{-x^2}$

27.  $y = \frac{e^{3x}}{1+3^x}$

## Differentiation Practice (cont.)

Find derivatives of the following by applying the Product Rule, Quotient Rule, Chain Rule or combination thereof.

28.  $y = \sin x^2 + x$

29.  $y = \cos x^3$

30.  $y = \cos^3 x$

31.  $y = x \sin x$

32.  $y = \frac{\sin x}{x}$

33.  $y = \frac{\cos x}{x^2}$

34.  $y = \frac{\sin x}{\cos 2x}$

35.  $y = \frac{\tan x}{x}$

36.  $y = \left( \frac{\sin x}{1 + \cos x} \right)^2$

37.  $y = \sqrt{\cos x}$

38.  $y = \sqrt{\tan x}$

39.  $y = 1 + \cos^2 3x$

40.  $y = \sin e^{3x}$

41.  $y = \sqrt{2 + \sin x}$

42.  $y = \sin^5 3x^4$

43.  $y = 2^{\tan x}$

44.  $y = \tan \sqrt[3]{x}$

45.  $y = \cos(\tan x)$

46.  $y = \sin^3 x \tan 4x$

47.  $y = \tan x^2 + \tan^2 x$

48.  $y = \sin^2(x \cos x)$

49.  $y = \cos xe^{2x}$

50.  $y = \sin e^{2x} + \tan(3x)$

51.  $y = \cos \sqrt{x} + e^{-x}$

Find derivatives of the following.

52.  $y = \ln \sqrt{x}$

53.  $y = \ln \sin x^3$

54.  $y = \arctan x^3$

55.  $y = \arcsin x^2$

56.  $y = 1 + x^2 \arctan x$

57.  $y = \arctan(\sin x)$

58.  $y = \arcsin(\arctan x)$