

*Instructions:* Differentiate (i.e. find the derivative) of the following functions.

### Basic Derivatives

1.  $f(x) = 3x^2 - 5x + 2$

2.  $f(x) = x^{0.8} + x$

3.  $f(x) = \sqrt{x}$

4.  $f(x) = 5e^x$

5.  $f(x) = \ln(5x)$

6.  $f(x) = \frac{2}{\sqrt{x}}$

7.  $f(x) = \log_3(x)$

8.  $f(x) = -3x^{-3}$

9.  $f(x) = 5^x$

10.  $f(x) = \ln\left(\frac{1}{x^2}\right)$

11.  $f(x) = \frac{1}{e^{2x}}$

12.  $f(x) = 6x^{10} - 5x^7 + 3x$

13.  $f(x) = x^{1.2} + x^{0.5}$

14.  $f(x) = x^{\frac{3}{2}} - x^{\frac{1}{4}}$

15.  $f(x) = e^{3x} - e^{-5x} + e$

16.  $f(x) = \left(\frac{1}{2}\right)^x$

17.  $f(x) = \frac{5}{\sqrt{x^3}} - \frac{1}{\sqrt[3]{x}}$

18.  $f(x) = \frac{1}{x^5} + \frac{x^2}{x^5}$

19.  $f(x) = 7x^{-2} - 4x^{-5}$

20.  $f(x) = e^{\frac{1}{2}x} + 7e^x - e^{-2}$

21.  $f(x) = \log_3(x) - \log_2(x^3)$

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

23.  $f(x) = 2x^5 - \frac{3}{2}x^4 + 5x$

24.  $f(x) = x^{2.2} + 2x^{0.2} - x^{-0.1}$

25.  $f(x) = 7x^{\frac{5}{7}} - 3x^{\frac{2}{5}} + 2x^{\frac{11}{2}}$

26.  $f(x) = 10^x - 5\log_3(x)$

27.  $f(x) = \ln(x^{-3}) + \ln(5)$

28.  $f(x) = \sqrt{e} + \frac{3}{e^x} - \log_3(x)$

29.  $f(x) = \ln(x^6) - \ln(x)$

30.  $f(x) = 7(3^{2x}) + \frac{5}{x}$

31.  $f(x) = -e^{7x}$

32.  $f(x) = \frac{1}{x^3}$

33.  $f(x) = \log_4(x^3) + \frac{1}{\sqrt{x^5}}$

## Product and Quotient Rule

$$34. f(x) = (x^2 + 3x - 5)(2x^2 - 2)$$

$$35. f(x) = \frac{x^2 - 5}{3x + 2}$$

$$36. f(x) = xe^x$$

$$37. f(x) = 3x(x + 2)^{-1}$$

$$38. f(x) = \frac{e^{3x}}{e^x - 1}$$

$$39. f(x) = \ln^2(x)$$

$$40. f(x) = \frac{5x^3}{\ln(x)}$$

$$41. f(x) = e^x(5x + 2)$$

$$42. f(x) = xe^x \ln(x)$$

$$43. f(x) = (2x^2 - 5x)(3x - 2)$$

$$44. f(x) = \frac{5x^2}{2x + 3}$$

$$45. f(x) = \frac{7x}{x + 2}$$

$$46. f(x) = \frac{x + 2}{x^2 - 4}$$

$$47. f(x) = x \ln(x)$$

$$48. f(x) = e^x x^{-1}$$

$$49. f(x) = 10^x \log(x)$$

$$50. f(x) = \frac{e^x}{3e^x + 5x}$$

$$51. f(x) = \frac{xe^x}{x^2 + 1}$$

## Chain Rule

52.  $f(x) = (3x - 5)^3$

53.  $f(x) = (e^x + 1)^5$

54.  $f(x) = \sqrt{x^2 + 1}$

55.  $f(x) = 5e^{-2x}$

56.  $f(x) = \ln(x^2 + 2x - 5)$

57.  $f(x) = \ln(e^x + 2x)$

58.  $f(x) = x^2(3x + 5)^3$

59.  $f(x) = \frac{1}{(x^2 + 7x - 2)^5}$

60.  $f(x) = e^{x^3 - 5x + 1}$

61.  $f(x) = \sqrt{\ln(x)}$

62.  $f(x) = (\ln(x) - 5)^3$

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

64.  $f(x) = e^{3x^2 - 5}(2x^3 + 1)^2$

65.  $f(x) = \ln(\sqrt{x^3 + 2x})$