1 Differentiation

Find the derivative.

1. $y = \frac{1}{x} + \sqrt{x} - \frac{1}{\sqrt{x}}$
2. $y = x^3 \left(x^2+1\right)^{1/3}$
3. $y = \ln \sqrt{5x^2-4}$
4. $y = \left(e^{x^2+2}\right)^2$
5. $y = \ln\left[\frac{(x+5)(2x-3)^2}{(2-x)}\right]$
6. $y = (3x-2)^4 \left(5x^2+3\right)^{2/3}$
7. $y = \frac{\sqrt{\ln x}}{e^{2x}}$
8. $x^2y^3 + 5xy^4 + 3y^2 = x^4 - 2x$
9. $y = 2^{x+4}$
10. $y = x - \sqrt{x^2+1}$
11. $y = \left(x^{1/3} - a^{1/3}\right)^{1/3}$
12. $y = \frac{e^{3x}}{x} + x \ln x$
13. $y = (x-1)^3 (2x+3)^{-2}$
14. $x^3 + x^2y + y^2 - x = 0$
15. $y = x \cos x$
16. $y = \frac{x^2+2}{x^2-1}$
17. $y = \sin^2 x + \tan x^3$
18. $y = \ln\left(1+x^2\right)$
19. $y = e^{\csc x + x}$
20. $y = \frac{x^2+x}{x^2+5}$
21. $y = \left(3x^2+2\right)^5$
22. $y = x^2 \tan x$
23. $y = \sin\left(x^3\right) + \cot^2 x$
24. $y = e^{2x+3}$
25. $y = \ln\left(x^3+5\right)$
26. $x^2 + y^2 + 2y = 0$
27. $y = \left(1+2x^2\right)\left(4x^2+1\right)^5$
28. $y = \frac{1+\tan x}{1+x^2}$
29. $y = \csc 3x + \cot 2x$
30. $y = e^{-x^2} + \ln x^4$
31. $y = \log_{10} x^2 + 2^x$
32. $y = 5x^3 - 3x + \frac{2}{x} - \sqrt{x} + 3$
33. $y = \frac{x^2-5}{x^2+5}$
34. $y = \sec x + \tan^2 x - \sin x$
35. $y = \ln \cos x$
36. $y = e^{x+\cot x}$
37. $xy - y^2 = 4$
38. $y = \left(2x^3 - 3x^2 + x\right)^{2/5}$
39. $y = (1-2x)^3 \sin x$
40. $y = \frac{\sqrt{x}+1}{\sqrt{x}-1}$
41. $y = \cos^2\left(x^3+2\right) - \csc(\tan x)$
42. $x^2y - x + y^2 - y = 0$
43. $y = \ln(\sec x) + e^{x^2}$
44. $x^3 + y^3 + 7 = 0$
45. $y = 3x^2 + \frac{2}{x^2} - \sqrt[3]{2x} + \frac{10}{\sqrt{x}}$
46. $y = \left(x^2-1\right)\sqrt[3]{3-x}$
47. $y = \ln\left[e^x e^{\sqrt{x}}\right]$
48. $y = \frac{(x-1)^3}{(2x^2+3)^2}$
49. $y = x^\pi + 2^x + \frac{4}{x^3} - e^{\pi^2+2\pi-7}$
50. $y = \ln\left(\frac{3x^2-4}{5x^3-4}\right)$
51. $y = \tan\left(\frac{x-2}{x+2}\right)$
52. $y = e^{\sin^3 x^2}$
53. $y = \sqrt{1+\cos^2 3x}$
54. $x^2 = y^2 + 25$
55. $y = \frac{3}{x^2} + \frac{x^2}{3} - (3x)^2 + \frac{1}{3x^2}$
56. $y = x^5\left(3x^2+5x-7\right)^{2/3}$
57. $y = \ln\sqrt[3]{x+\cos^2 3x}$
58. $y = e^{\sqrt{x}} + \sqrt{x} \cdot e^x$
59. $y = 3\tan(2x+\pi)$

60. $y = \left[\ln x^2\right]^3$

61. $y = \frac{\sqrt{x}}{15x+3}$

62. $y = e^{x \ln x}$

63. $y = \frac{14}{e} + \ln 7 - 3\pi^2 - \frac{1}{x}$

64. $y = x\left(x+1\right)^2\left(x+2\right)^3$

65. $3xy + y^2 = 5x + 17$

66. $x^2 + xy - y^2 + 1 = 0$

67. $y = -4x^3 + \frac{5}{x} + \sqrt{x} + \ln 2x$

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

69. $y = x\left(\cos 2x\right)^3$

70. $y = e^{\tan x} + \ln\left(\frac{1+x}{2-x}\right)$

71. $y = \frac{\sqrt{x+1}\left(x^2+3\right)^5}{x+2}$

72. $\sqrt{xy} = \frac{1}{x} + \frac{1}{y}$

73. $y = \frac{5}{x} + \frac{x}{5} + \sqrt[5]{x} + x^5 + x^{-5}$

74. $y = (3x)^{2e}$

75. $y = \frac{3x^2+8}{2x^3-x^2}$

76. $y = \sqrt{2x^2+1}\left(5x^3+x\right)^4$

77. $y = \tan^2 x + \sec x^2 - \sqrt{\cot x} + \csc\left(\ln x\right)$

78. $y = \frac{x\sqrt{x+1}}{x+5}$

79. $y = (5x)^3 - 3x^4 + \frac{6}{\cos x}$

80. $y = \frac{x^2+3x-1}{(x^3-5)^2}$

81. $y = e^{\pi} + \sqrt{\cos x^2} - \frac{1}{3\sqrt{x}}$

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

83. $xy^2 - 2x^3 = 2$

84. $y = \ln\left[\frac{x^2\sqrt{3+2x^2}}{(x^4+x^2)^3}\right]$

85. $y = (3x-4)^2(2x-1)^2$

86. $xy = (x-y)^2 + 1$

87. $y = \frac{(x+1)^{1/3}}{2x^{1/6}}$

88. $y = \sin^2 2x + \tan x^3$

89. $y = \ln\left(x^3 - 2x^2 + x - 1\right)$

90. $y = e^{x^2 \sec x}$

91. $y = x^{\sqrt[3]{x}}$

92. $y = \ln\sin x$

93. $y^3 = 4 + 2yx + x^2$

94. $y = 3x^2 + \frac{2}{x^2} - \sqrt{x} + 10$

95. $y = \left(x^2 - x\right)^{10}\left(x^3 + 2x - 1\right)$

96. $y = \frac{e^{x^2+2x}}{(x^3+1)^{4/3}}$

97. $y = \ln\left[\frac{\sqrt{(x^3+1)^5}}{(x^2-1)^3}\right]$

98. $y = x^{x^2}$

99. $y = 3x^{1/3} - 2x^{-2/5}$

100. $y = 2\left(x^4 - 5\right)^9$

101. $y = x^7 e^{3x}$

102. $y = \ln\left(\frac{x}{3x^2+1}\right)$

103. $y = (2x-3)\left(\tan x + 1\right)^2$

104. $y = \left(2 - e^{x^2}\right)^3 + \log_3 x$

105. $y = (2x)^{\cos x}$

106. $xy^2 + y\ln x = x$

107. $y = \left(2x^3\right)\sqrt{3x^2-1}$

108. $y = \left[\ln\left(x^2+1\right)\right]^2 - \ln\left[\left(x^2+1\right)^2\right]$

109. $y = \frac{2x^3}{[\tan(3x+1)]^2}$

110. $x^5 + xy - y^5 = 8x^2$

111. $y = (x+3)^2\left(x^2 - 2x\right)$

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

113. $y = \frac{e^{\sin x}}{2x-5}$

114. $y = (\cos x)^{\ln x}$

115. $y = \sqrt{\tan 2x} - \sec^3(4x-1)$

116. $y = \ln\left[\frac{\left(3x^2-2x\right)^2(x-1)}{e^{x^2-2x}}\right]$

117. $y = x^2\cos x$

118. $y = \sin 2\theta$ and $\theta = 3x + \pi/6$

119. $\ln(xy) + x + y^2 = 2$

120. $y = (x+1)^{1/x}$

121. $y = \ln\left[\frac{e^x+1}{x+5}\right]$

122. $y = \tan\sqrt{x}\sec x^2$

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

124. $y = e^{x^2} + \ln\left(2^{x^2}+1\right)$

125. $y = (\ln x)^{x^2}$

126. $y = \frac{5x^2\csc^4 7x}{2}$

127. $y = \frac{1}{\left(\sqrt[3]{5-2x^3}\right)^2}$

128. $y = \frac{\tan(5x-\pi)}{e^{4+x^2}}$

129. $y = 7\ln\left[\frac{1}{x}\right] + \frac{3}{\ln 4x} + (\ln 2)^{-x}$

130. $y = \sqrt{\tan^3 5x}$

131. $y = \log\left(\frac{x}{x+3}\right)$

132. $y = x^2\sin\sqrt{x}$

133. $y = 3^{x\ln x}$

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

135. $y = 2u - 1$ and $\frac{du}{dx} = \frac{x+1}{x-1}$

136. $y = \sqrt{\sec 2x}$

137. $y = 4x\left(x^2-9\right)^5$

138. $\cos(x+y) = y\sin x$

139. $y = \ln\left[\frac{x^2}{x^2+1}\right] + e^{x^3-1}$

140. $y = (3x)^{2x}$

141. $y = \sin^4\left(3e+x^2\right)$

142. $y = \ln\frac{\left(3x^5-2x^3\right)^4}{\sqrt[3]{x^4+5x}}$

143. $y = \csc\left[\frac{3x-1}{x^2+1}\right]$

144. $y = \left(x^2+1\right)^{x^2}$