201-SH2-AB - Exercises #11 - Mixed Derivatives

Find dy/dx for each of the following. Use implicit or logarithmic differentiation where appropriate.

1. $x^2y^3 = \sin(2y)$
2. $y = \ln\left(\dfrac{\cos^3 x(3x^2-8)^7}{\sqrt{x}(2x-1)^{11}}\right)$
3. $y = \cot(xe^x)$
4. $xe^y = y\sin x$
5. $y = \pi x^4 - \dfrac{2}{x} + \sqrt[3]{x^2} + \log_5(\sin x) + \ln 2$
6. $y = (2^{3x+1} + 4x)(\log_2(4x+1) - 6)$
7. $y = \sqrt{\cos(3x^2+1) + x}$
8. $y = (x^4-5)^{\tan x}$
9. $y = 6(xe^x+1)^3 + x^2$
10. $y = \sin(\ln(x^2+x) - 7x)$
11. $y = e^{x^4-x} - \sqrt{x} + \dfrac{2}{x^3} - x^{\ln 3} + \log_3(5x^4 - 2x)$
12. $y = 5^{3x}\csc^4(3x^4)$
13. $y = \sqrt[3]{\left(x^3 - e^{x^4}\right)^7}$
14. $y = \sec\sqrt{x^4 - 7x}$
15. $y = \sqrt[5]{2x^3 - 9\cos(x^2)}$
16. $y = \ln\left(\dfrac{x^5(3x-4)^3}{\sqrt[5]{7x-3}\cot^3 x}\right)$
17. $\dfrac{x}{y} = \ln y - x^2y$
18. $y = (\sin x)^{\ln x}$
19. $y = 3(2x+5)^2(3x - e^{2x})^6$
20. $(x+4y)^3 = 1 - 2xy$
21. $y = (x^2-6)^3(1-9x)^4$
22. $y = \dfrac{8x^4}{1+\tan x}$
23. $y = (x^2+5x)^{x^3-7x}$
24. $y = \dfrac{(9x^2-4)^7\sqrt{3x^4-7}}{e^x \ln x^5}$
25. $y = (x^7 - 3x)^{\ln x}$
26. $y = \left(\dfrac{x^5 - 7x^2}{3x^4+9}\right)^6$
27. $y = 3^{x^3-1}\cos(3x^3)$
28. $y = \dfrac{1-\tan(2x)}{1+\ln x}$
29. $y = \dfrac{(x+1)^4 \ln x}{e^{3x}\cos^2(5x)}$
30. $y = \dfrac{2}{x^3} - \sqrt[5]{x^2} + \log_3(\cot x) + 6^{2x} - e^2$
31. $y = \ln\left(\dfrac{(2x+4)^3 e^{4x}}{\cot^5 x}\right)$
32. $y = 2x^3e^{4x} + \tan(5x)$
33. $5y - 3x^4y^3 + 6x^4 - 4y = 3 + 5x^6y^3$
34. $y = e^2x^4 - \sqrt[4]{x} + \dfrac{2}{\sqrt{x}} + e^{x^3}$
35. $y = (x^2 - 3x^7)^{5x}$
36. $y = \dfrac{5^{3x}}{\cos(2x)}$
37. $(x+3y)^2 = x^2 + e^{2y}$
38. $y = \ln\left[\sin\left(e^{\sqrt{x}}\right)\right]$
39. $e^{x+y^2} = y\ln y - x^2y$
40. $y = \tan^4\left(x^2 + e^{x^2}\right) + 1$
41. $y = 5xe^{2x} + \sqrt{\tan x}$
42. $y = \dfrac{6e^x\sqrt[5]{x^3+6x^2}}{(2x-9)^6\ln x}$
43. $y = \tan^3(e^x - x^e)$
44. $y = \dfrac{\log_2 x^3}{\sqrt{x} + 8\sin x}$
45. $y = \left(\ln x + e^{3x}\right)^{\sin x}$
46. $y = \dfrac{(2x+5)^3e^{5x}}{7\tan^2 x}$
47. $y = \log_2\sqrt{x} + 4\sqrt[3]{x^5} - 4\cot(2x-3)$
48. $y = \dfrac{\cot(3x+1) + 4x^3}{8x^4 - 4x^8}$
49. $y = (4x^{-5} - 6x^{-3})\left(\dfrac{x^4}{3} - x\right)$

50. $y = \dfrac{5x^2}{3} + \log_5 x - \sec(2x) + \dfrac{2}{\sqrt[7]{x}} + \pi^{512+e}$

51. $\cos(y - 3x) = x^2 y - 2x$

52. $y = e^{x+\tan x}$

53. $y = e^{x^2-4x} + x^\pi - \dfrac{3}{x^5} + 4\sqrt[5]{x^7}$

54. $xy^3 + xy = 14$

55. $y = \dfrac{2^{x^2} - x}{\sec x}$

56. $y = \dfrac{4^{2x-1}}{\cot x - 3e^x}$

57. $y = \log_4(8x^3 - 6x) + 6^{4x^2-3x+1} + e^x \tan(3x^4)$

58. $y = \ln\left[\dfrac{(5x^3 - 7x)^3\sqrt{x^4 - 3x}}{(x^2 - 6x^5)^2}\right]$

59. $y = 2x\sqrt{x+1}$

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

61. $y = \sec(4x^3 + 5) + x\sin^3 x$

62. $\dfrac{-4x^2}{y} = x\ln y - y$

63. $y = 3(\sin x + 4x)^x$

64. $y = \ln\left(\dfrac{e^{5x}\sqrt{x-5}}{(3x+1)\sec x}\right)^2$

65. $y = x^{\cos(3x)}$

66. $y = 2x^{x^2+1}$

67. $y = (x^3 - 4x)^{\sec(6x)}$

68. $y = \sqrt{\sec(x^2 - \ln x)}$

69. $y = \pi^3 + 3^{\pi x} - x^3 + \log_3 \pi - (\ln 3)x - \dfrac{3}{\pi x}$

70. $y = (1 + \sqrt{x})^{3x}$

71. $y = x^{\sin x}(3x + 2)^7$

72. $y = \dfrac{e^{9x} + 1}{\ln(6x^3 - 3x^5) - 3}$

73. $x^2y^3 + 3xy^5 - 4x + 3y^2 = 7 + 7x^2 - 4y$

74. $y = \dfrac{3x + \cos x}{1 - \ln x}$

75. $y = \dfrac{\sqrt{x^5} - 2x + \frac{2}{3x^4}}{3 - \csc(e^x)}$

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

77. $y = 8x^3 - \dfrac{4}{x} + \dfrac{5}{\sqrt{3x}} + 4\pi^2$

78. $y = \left(e^{7x} + \sin^4 x\right)^5$

79. $y = \dfrac{\tan x + 1}{\sec 2x}$

80. $y = \sqrt{\log_2(3x^2 + 1) + 3x^2}$

81. $y = \dfrac{-2}{x^3} + 2\sqrt[3]{x^4} + \pi^x + e^{\pi^2}$

82. $y = \ln\left[\dfrac{(x^4 - 6x)^3(7x - 1)^2}{\cot^3 x}\right]$

83. $y = \dfrac{\sqrt{3x + 2}}{x - 7^x}$

84. $y = 3(\cos(2x))^{x^2+2}$

85. $y = \ln\left[\dfrac{(x^2 + 1)^4}{x^x\sqrt[3]{\tan x + 4}}\right]$

86. $y = \cos^2(\sec(1 - x))$

87. $y = \sin^2(x^3 - 7^x)$

88. $y = 3^x + \sqrt[5]{x^3} + \csc x - 5\log_3 x + e^2$

89. $y = \sec^3(\cos(1 - x))$

90. $y = (3x^4 - 2)^{x^3+1}$

91. $y = \dfrac{e^x(3x - 2)^4}{\ln x \sin^2(5 - x)}$

92. $y = x^2 \sec(\log_5 x)$

93. $y = \frac{3}{2x^6} - \sqrt[3]{x^4} + \log_8 x + \pi$

94. $y = \dfrac{(x^3 e^{3x\sin x})^4}{\ln(2x)}$

95. $(x - y)^2 + 4x - 5y - 1 = 0$

96. $y = (5x + \sqrt{x})^{x^3+1}$

97. $y = \dfrac{2^{5x-7}}{3x + \cot(2x)}$

98. $y = \ln\left(\dfrac{\sqrt{x}\tan^8 x}{(x^2 + 4)10}\right)$

99. $y = 2(7 - e^{2x^3})^5(5 - 6x^4)^3$

100. $y = 3^{2x+1} + \log_7(x^2 - 7) + \sqrt[5]{x^3} - e^3$

101. $y = \dfrac{3x^3 - 3}{\sqrt[3]{x} + x}$

102. $y = \sqrt[6]{x^7} - \dfrac{6}{x^7} + \ln 5 - \sqrt{5}x + e^x - x^e$

103. $(x^3 + y^2 + 7)^4 = 4x + 3y + 9$

104. $x^2y^2 + y \ln x = 4x$

105. $y = 3(e^{2x} - 1)^5(2 - 9x)^4$

106. $y = (3x + \sqrt{x})^{x^3 - 2x}$

107. $y = \log_3(x^2 - 7x) + \sqrt[5]{x^2} + \dfrac{1}{(6x^3 - 8)^2}$

108. $y = (4x^5 + 3x)^3(3x^2 - 1)^5$

109. $y = \dfrac{1 + \sin x}{x + \cos x}$

110. $\ln(xy) - y^2 = 5$

111. $y = (\cos x + 4x)^{\sqrt{x}}$

112. $y = \dfrac{\sin^2(4x)}{x^3 + 2x}$

113. $y = \dfrac{3x - \cot(3x)}{1 + \csc(3x)}$

114. $y = \sqrt[3]{x} - 3x^\pi - \sqrt{x^3} + 4e$

115. $y = \sqrt[3]{\sec(2x^3 + 4) + 6}$

116. $y = 7^{e^x} + \log_3(e^x) + \ln(x^3) + \sqrt[4]{x^3}$

117. $y = (7 - 5^{3x+1})^3(\sec(x^3) - 7)$

118. $y = (x^2 - \log_3 x + \pi^e)^{10} \sin^2 x$

119. $y = \ln\left(\dfrac{3x^5 \cot^4 x}{(2x)^3(3x^4 + 5)^8}\right)$

120. $y = \dfrac{4^x}{(3x^2 + 10x)^3}$

121. $y = 2x^e + \dfrac{4}{\sqrt{x}} + \sqrt[3]{x^5}$

Answers:

1. $\dfrac{2xy^3}{2\cos(2y)-3x^2y^2}$

2. $-3\tan x+\dfrac{42x}{3x^2-8}-\dfrac{1}{2x}-\dfrac{22}{2x-1}$

3. $g'(x)=-\csc^2(xe^x)(e^x+xe^x)$

4. $\dfrac{y\cos x-e^y}{xe^y-\sin x}$

5. $4\pi x^3+\dfrac{2}{x^2}+\dfrac{2}{3\sqrt[3]{x}}+\dfrac{\cos x}{(\ln 5)\sin x}$

6. $(3\ln 2\cdot 2^{3x+1}+4)(\log_2(4x+1)-6)+\dfrac{4(2^{3x+1}+4x)}{(4x+1)\ln 2}$

7. $\dfrac{1-6x\sin(3x^2+1)}{2\sqrt{\cos(3x^2+1)+x}}$

8. $(x^4-5)^{\tan x}\left(\sec^2 x\ln(x^4-5)+\dfrac{4x^3\tan x}{x^4-5}\right)$

9. $18(xe^x+1)^2(e^x+xe^x)+2x$

10. $\cos(\ln(x^2+x)-7x)\left[\dfrac{2x+1}{x^2+x}-7\right]$

11. $e^{x^4-x}(4x^3-1)-\dfrac{1}{2\sqrt{x}}-\dfrac{6}{x^4}-\ln(3)x^{\ln(3)-1}+\dfrac{20x^3-2}{(5x^4-2x)\ln 3}$

12. $3\ln(5)\cdot 5^{3x}\csc^4(3x^4)-48x^3\cdot 5^{3x}\csc(3x^4)\cot(3x^4)$

13. $\dfrac{7}{3}(x^3-e^{x^4})^{4/3}(3x^2-4x^3e^{x^4})$

14. $\dfrac{(4x^3-7)\sec\sqrt{x^4-7x}\tan\sqrt{x^4-7x}}{2\sqrt{x^4-7x}}$

15. $\dfrac{6x^2+18x\sin(x^2)}{5(2x^3-9\cos(x^2))^{4/5}}$

16. $\dfrac{5}{x}+\dfrac{9}{3x-4}-\dfrac{7}{5(7x-3)}+\dfrac{3\csc^2 x}{\cot x}$

17. $\dfrac{2xy^3+y}{x+y-x^2y^2}$

18. $(\sin x)^{\ln x}\left[\dfrac{\ln(\sin x)}{x}+\ln x\cot x\right]$

19. $12(2x+5)(3x-e^{2x})^6+18(2x+5)^2(3x-e^{2x})^5(3-2e^{2x})$

20. $\dfrac{-2y-3(x+4y)^2}{12(x+4y)^2+2x}$

21. $6x(x^2-6)^2(1-9x)^4-36(x^2-6)^3(1-9x)^3$

22. $\dfrac{32x^3(1+\tan x)-8x^4\sec^2 x}{(1+\tan x)^2}$

23. $(x^2+5x)^{x^3-7x}\left[(3x^2-7)\ln(x^2+5x)+(x^3-7x)\left(\dfrac{2x+5}{x^2+5x}\right)\right]$

24. $\dfrac{(9x^2-4)^7\sqrt{3x^4-7}}{e^x\ln x^5}\left[\dfrac{126x}{9x^2-4}+\dfrac{6x^3}{3x^4-7}-1-\dfrac{1}{x\ln x}\right]$

25. $(x^7-3x)^{\ln x}\left[\dfrac{(7x^6-3)\ln x}{x^7-3x}+\dfrac{\ln(x^7-3x)}{x}\right]$

26. $6\left(\dfrac{x^5-7x^2}{3x^4+9}\right)^5\left[\dfrac{(5x^4-14x)(3x^4+9)-12x^3(x^5-7x^2)}{(3x^4+9)^2}\right]$

27. $-9x^2\cdot 3^{x^3-1}\sin(3x^3)+3^{x^3-1}\ln 3\cdot 3x^2\cos(3x^3)$

28. $\dfrac{-2(1+\ln x)\sec^2(2x)-\frac{1-\tan 2x}{x}}{(1+\ln x)^2}$

29. $\dfrac{(x+1)^4\ln x}{e^{3x}\cos^2(5x)}\left[\dfrac{4}{x+1}+\dfrac{1}{x\ln x}-3+10\tan(5x)\right]$

30. $-\dfrac{6}{x^4}-\dfrac{2}{5x^{3/5}}-\pi-\dfrac{\csc^2 x}{\cot x(\ln 3)}+2(\ln 6)6^{2x}$

31. $\dfrac{3}{x+2}+4+\dfrac{5\csc^2 x}{\cot x}$

32. $6x^2e^{4x}+8x^3e^{4x}+5\sec^2(5x)$

33. $\dfrac{30x^5y^3+12x^3y^3-24x^3}{1-15x^6y^2-9x^4y^2}$

34. $4e^2x^3-\dfrac{1}{4x^{3/4}}-x^{-3/2}+3x^2e^{x^3}$

35. $(x^2-3x^7)^{5x}\left[5\ln(x^2-3x^7)+\dfrac{5x(2x-21x^6)}{x^2-3x^7}\right]$

36. $\dfrac{3\ln(5)\cdot 5^{3x}\cos(2x)+2\cdot 5^{3x\sin(2x)}}{\cos^2(2x)}$

37. $\dfrac{2x-2(x+3y)}{6(x+3y)-2e^{2y}}=\dfrac{-3y}{3x+9y-e^{2y}}$

38. $\dfrac{\cos e^{\sqrt{x}}e^{\sqrt{x}}}{2\sqrt{x}\sin e^{\sqrt{x}}}$

39. $\dfrac{e^{x+y^3}+2xy}{\ln y+1-x^2-3y^2e^{x+y^3}}$

40. $4\tan^3\left(x^2+e^{x^2}\right)\sec^2\left(x^2+e^{x^2}\right)\left(2x+2xe^{x^2}\right)$

41. $5e^{2x}+10xe^{2x}+\dfrac{\sec^2 x}{2\sqrt{\tan x}}$

42. $\dfrac{6e^x\sqrt[5]{x^3+6x^2}}{(2x-9)^6\ln x}\left[1+\dfrac{3x^2+12x}{5(x^3+6x^2)}-\dfrac{12}{2x-9}-\dfrac{1}{x\ln x}\right]$

43. $3\tan^2(e^x-x^e)\sec^2(e^x-x^e)(e^x-ex^{e-1})$

44. $\dfrac{6\sqrt{x}(\sqrt{x}+8\sin x)-x\ln 2(\log_2 x^3)(1+16\sqrt{x}\cos x)}{2(\ln 2)x^{3/2}(\sqrt{x}+8\sin x)^2}$

45. $(\ln x+e^{3x})^{\sin x}\left[\cos x\ln(\ln x+e^{3x})+\dfrac{\sin x}{\ln x+e^{3x}}\left(\dfrac{1}{x}+3e^{3x}\right)\right]$

46. $\dfrac{(2x+5)e^{5x}}{7\tan^2 x}\left[\dfrac{6}{2x+5}+5-\dfrac{2\sec^2 x}{\tan x}\right]$

47. $\dfrac{1}{2x\ln 2}+\dfrac{12}{5}x^{2/3}-4\csc^2(2x-3)$

48. $\dfrac{(12x^2 - 3\csc^2(3x+1))(8x^4 - 4x^8) - (\cot(3x+1) + 4x^3)(32x^3 - 32x^7)}{(8x^4 - 4x^8)^2}$

49. $\left(-20x^{-6} + 18x^{-4}\right)\left(\dfrac{x^4}{3} - x\right) + \left(4x^{-5} - 6x^{-3}\right)\left(\dfrac{4x^3}{3} - 1\right)$

50. $\dfrac{10}{3}x + \dfrac{1}{x\ln 5} - 2\sec(2x)\tan(2x) - \dfrac{2}{7x^{8/7}}$

51. $\dfrac{3\sin(y-3x) - 2xy + 2}{\sin(y-3x) + x^2}$

52. $e^{x+\tan x}(1 + \sec^2 x)$

53. $(2x-4)e^{x^2-4x} + \pi x^{\pi-1} + \dfrac{15}{x^6} + \dfrac{28}{5}x^{2/5}$

54. $\dfrac{-y - y^3}{3xy^2 + x}$

55. $\dfrac{(2x \cdot 2^{x^2}(\ln 2) - 1)\sec x - \sec x \tan x(2^{x^2} - x)}{\sec^2 x}$

56. $\dfrac{2 \cdot 4^{2x-1}(\ln 4)(\cot x - 3e^x) + 4^{2x-1}(\csc^2 x + 3e^x)}{(\cot x - 3e^x)^2}$

57. $\dfrac{24x^2 - 6}{\ln 4(8x^3 - 6x)} + 6^{4x^2-3x+1}(\ln 6)(8x - 3) + e^x \tan(3x^4) + 12x^3 e^x \sec^2(3x^4)$

58. $\dfrac{3(15x^2 - 7)}{5x^3 - 7x} + \dfrac{4x^3 - 3}{2(x^4 - 3x)} - \dfrac{2(2x - 30x^4)}{x^2 - 6x^5}$

59. $2\sqrt{x+1} + \dfrac{x}{\sqrt{x+1}}$

60. $(\cos x)^{x^2}\left[2x\ln(\cos x) - \dfrac{x^2 \sin x}{\cos x}\right]$

61. $12x^2 \sec(4x^3+5)\tan(4x^3+5) + \sin^3 x + 3x\sin^2 x \cos x$

62. $\dfrac{y^2 \ln y + 8xy}{4x^2 - xy + y^2}$

63. $3(\sin x + 4x)^x\left(\ln(\sin x + 4x) + \dfrac{x\cos x + 4x}{\sin x + 4x}\right)$

64. $2\left(\dfrac{1}{2(x-5)} + 5 - \dfrac{3}{3x+1} - \tan x\right)$

65. $x^{\cos(3x)}\left[\dfrac{\cos(3x)}{x} - 3\sin(3x)\ln x\right]$

66. $2x^{x^2+1}\left(2x\ln x + \dfrac{x^2+1}{x}\right)$

67. $(x^3 - 4x)^{\sec(6x)}\left[6\sec(6x)\tan(6x)\ln(x^3 - 4x) + \dfrac{(3x^2 - 4)\sec(6x)}{x^3 - 4x}\right]$

68. $\dfrac{\sec(x^2 - \ln x)\tan(x^2 - \ln x)\left(2x - \frac{1}{x}\right)}{2\sqrt{\sec(x^2 - \ln x)}}$

69. $(\pi \ln 3)3^{\pi x} - 3x^2 - \ln 3 + \dfrac{3}{\pi x^2}$

70. $(1 + \sqrt{x})^{3x}\left[3\ln(1 + \sqrt{x}) + \dfrac{3x}{2\sqrt{x(1+\sqrt{x}}}\right]$

71. $x^{\sin x}(3x+1)^7[\cos(\ln x) + \dfrac{\sin x}{x} + \dfrac{21}{3x+2}]$

72. $\dfrac{(9e^{9x})[\ln(6x^3 - 3x^5) - 3] - (e^{9x} + 1)\left(\frac{18x^2 - 15x^4}{6x^3 - 3x^5}\right)}{[\ln(6x^3 - 3x^5) - 3]^2}$

73. $\dfrac{14x + 4 - 3y^5 - 2xy^3}{3x^2y^2 + 15xy^4 + 6y + 4}$

74. $\dfrac{(3 - \sin x)(1 - \ln x) + \frac{3x + \cos x}{x}}{(1 - \ln x)^2}$

75. $\dfrac{\left(\frac{5}{2}x^{3/2} - 2 - \frac{8}{3x^5}\right)(3 - \csc e^x) - \left(x^{5/2} - 2x + \frac{2}{3x^4}\right)\csc(e^x)\cot(e^x)e^x}{(3 - \csc(e^x))^2}$

76. $\dfrac{12x}{2x^2 - 1} + 2$

77. $24x^2 + \dfrac{4}{x^2} - \dfrac{5}{2\sqrt{3x^3}}$

78. $5\left(e^{7x} + \sin^4 x\right)^4\left[7e^{7x} + 4\sin^3 x \cos x\right]$

79. $\dfrac{\sec^2 x \sec 2x - 2(\tan x + 1)\sec 2x \tan 2x}{\sec^2 2x}$

80. $\dfrac{\frac{6x}{(3x^2+1)\ln 2} + 6x}{2\sqrt{\log_2(3x^2+1) + 3x^2}}$

81. $6x^{-4} + \dfrac{8}{3}x^{1/3} + \pi^x \ln \pi$

82. $y = \dfrac{3(4x^3 - 6)}{x^4 - 6x} + \dfrac{14}{7x - 1} + \dfrac{3\csc^2 x}{\cot x}$

83. $\dfrac{\frac{3}{2}(3x+2)^{-1/2}(x - 7^x) - (1 - 7^x \ln 7)\sqrt{3x+2}}{(x - 7^x)^2}$

84. $3(\cos(2x))^{x^2+2}\left[2x\ln(\cos(2x)) - 2(x^2+2)\tan(2x)\right]$

85. $\dfrac{8x}{x^2+1} - \ln x - 1 - \dfrac{\sec^2 x}{3(\tan x + 4)}$

86. $2\cos(\sec(1-x))\sin(\sec(1-x)\sec(1-x)\tan(1-x)$

87. $f'(x) = 2\sin(x^3 - 7^x)\cos(x^3 - 7^x)(3x^2 - 7^x \ln 7)$

88. $3^x \ln 3 + \dfrac{3}{5x^{2/5} - \csc x \cot x - \dfrac{5}{x \ln 3}}$

89. $3\sec^2(\cos(1-x))\sec(\cos(1-x))\tan(\cos(1-x))\sin(1-x)$

90. $(3x^4 - 2)^{x^3+1}\left[3x^2\ln(3x^4 - 2) + \dfrac{12x^3(x^3+1)}{3x^4 - 2}\right]$

91. $\dfrac{e^x(3x-2)^4}{\ln x \sin^2(5-x)}\left[n1 + \dfrac{12}{3x-2} - \dfrac{1}{x\ln x} + 2\cot(5-x)\right]$

92. $2x\sec(\log_5 x) + \dfrac{x}{\ln 5}\sec(\log_5 x)\tan(\log_5 x)$

93. $y' = -9x^{-7} - \frac{4}{3}x^{1/3} + \frac{1}{x\ln 8}$

94. $\dfrac{(x^3e^{3x}\sin x)^4}{\ln(2x)}\left[\dfrac{12}{x} + 12 + 4\cot x - \dfrac{1}{x\ln(2x)}\right]$

95. $\dfrac{2y-2x-4}{2y-2x-5}$

96. $(5x+\sqrt{x})^{x^3+1}\left[3x^2\ln(5x+\sqrt{x}) + \dfrac{(x^3+1)\left(5+\frac{1}{2\sqrt{x}}\right)}{5x+\sqrt{x}}\right]$

97. $\dfrac{2^{5x-7}\ln 2\cdot 5(3x+\cot(2x)) - 2^{5x-7}(3-2\csc^2(2x))}{(3x+\cot(2x))^2}$

98. $\dfrac{1}{2x} + \dfrac{8\sec^2 x}{\tan x} - \dfrac{20x}{x^2+4}$

99. $-60(7-e^{2x^3})^4x^2e^{2x^3}(5-6x^4)^3 - 144x^3(7-e^{2x^3})^5(5-6x^4)^2$

100. $2\ln 3\cdot 3^{2x+1} + \dfrac{2x}{(x^2-7)\ln 7} + \dfrac{3}{5x^{2/5}}$

101. $\dfrac{9x^2(\sqrt[3]{x}+x) - (3x^3-3)(\frac{1}{3}x^{-2/3}+1)}{(\sqrt[3]{x}+x)^2}$

102. $\dfrac{7}{6}x^{1/6} + 42x^{-8} - \sqrt{5} + e^x - ex^{e-1}$

103. $\dfrac{4-12x^2(x^3+y^2+7)^3}{8y(x^3+y^2+7^3-3}$

104. $\dfrac{4x-2x^2y^2-y}{2x^3t+x\ln x}$

105. $30e^{2x}(e^{2x-1)^4(2-9x)^4} - 108(e^{2x}-1)^5(2-9x)^3$

106. $(3x+\sqrt{x})^{x^3-2x}\left[(3x^2-2)\ln(3x+\sqrt{x}) + \dfrac{(x^3-2x)\left(3+\frac{1}{2\sqrt{x}}\right)}{3x+\sqrt{x}}\right]$

107. $\dfrac{2x-7}{(x^2-7x)\ln 3} + \dfrac{2}{5x^{3/5}} - \dfrac{36x^2}{(6x^3-8)^3}$

108. $3(4x^5+3x)^2(20x^4+3)(3x^2-1)^5 + 30x(4x^5+3x)^3(3x^2-1)^4$

109. $\dfrac{\cos x(x+\cos x) - (1-\sin x)(1+\sin x)}{(x+\cos x)^2}$

110. $\dfrac{y}{2xy^2-x}$

111. $(\cos x+4x)^{\sqrt{x}}\left(\frac{1}{2\sqrt{x}}\ln(\cos x+4x) + \sqrt{x}\left(\frac{-\sin x+4}{\cos x+4x}\right)\right)$

112. $\dfrac{8\sin(4x)\cos(4x)(x^3+2x) - \sin^2(4x)(3x^2+2)}{(x^3+2x)^2}$

113. $\dfrac{(3+3\csc^2(3x))(1+\csc(3x)) + (3x-\cot(3x))3\csc(3x)\cot(3x)}{(1+\csc(3x))^2}$

114. $\dfrac{1}{3x^{2/3}} - 3\pi x^{\pi-1} - \dfrac{3}{2}\sqrt{x}$

115. $\frac{1}{3}[\sec(2x^3+4)+6]^{-2/3}\sec(2x^3+4)\tan(2x^3+4)(6x^2)$

116. $7^{e^x}\ln(7)e^x + \dfrac{1}{\ln 3} + \dfrac{3}{x} + \dfrac{3}{4x^{1/4}}$

117. $-9\ln 5(7-5^{3x+1})^2(5^{3x+1})(\sec x^3-7) + (7-5^{3x+1})x^3\sec x^3\tan x^3(3x^2)$

118. $10(x^2-\log_3 x+\pi^e)^9\left(2x - \dfrac{1}{x\ln 3}\right)\sin^2 x + 2\sin x\cos x(x^2-\log_3 x+\pi^e)^10$

119. $\dfrac{2}{x} - \dfrac{4\csc^2 x}{\cot x} - \dfrac{96x^3}{3x^4+5}$

120. $\dfrac{4^x[\ln 4(3x^2+10x) - 18x - 30]}{(3x^2+10x)^4}$

121. $2ex^{e-1} - \dfrac{2}{x^{3/2}} + \dfrac{5}{3}x^{2/3}$
