The Weekly Rigor

No. 182 "A mathematician is a machine for turning coffee into theorems." December 16, 2017

101 Problems in Calculating Derivatives Using the Chain Rule with Solutions

(Part 18)

52. $f'(x) = \frac{\frac{\arctan(3x)}{x} - \frac{3\ln(4x)}{1+9x^2}}{\arctan^2(3x)}$

53. $f'(x) = \frac{6(\ln(2x)+\ln(x))^2}{x}$

54. $f'(x) = \frac{4}{3}\left(x^{\frac{1}{2}} + x^{\frac{2}{3}}\right)^{\frac{1}{3}}\left(\frac{1}{2}x^{-\frac{1}{2}} + \frac{2}{3}x^{-\frac{1}{3}}\right)$

55. $f'(x) = 10x\sin^4(x^2)\cos(x^2)$

56. $f'(x) = \frac{1}{x}$

57. $f'(x) = \frac{1}{1+\arcsin^2(x)}\left(\frac{1}{\sqrt{1-x^2}}\right)$

58. $f'(x) = -\frac{1}{4}\left(x^{\frac{1}{2}} + x\right)^{-\frac{5}{4}}\left(\frac{1}{2}x^{-\frac{1}{2}} + 1\right)$

59. $f'(x) = 3e^{3x}$

60. $f'(x) = \frac{e^{\tan(\ln(3x))}\sec^2(\ln(3x))}{x}$

61. $f'(x) = \frac{x}{\sqrt{x^2+3}}$

62. $f'(x) = -3\cos^2(x)\sin(x)$

63. $f'(x) = -4\left(x^{\frac{3}{4}} + x^{\frac{1}{2}}\right)^{-5}\left(\frac{3}{4}x^{-\frac{1}{4}} + \frac{1}{2}x^{-\frac{1}{2}}\right)$

64. $f'(x) = \frac{\sec^2(\arcsin(x))}{\sqrt{1-x^2}}$

65. $f'(x) = \frac{1}{x\ln(x)}$

66. $f'(x) = -\frac{1}{2}\sin\left(\frac{1}{2}x\right)$

67. $f'(x) = 3x\sqrt{x^2+2}$

68. $f'(x) = \frac{-3x(5x^3+2)}{7\sqrt[7]{(x^5+x^2)^{10}}}$

69. $f'(x) = \frac{e^{\arctan(x)}}{1+x^2}$

70. $f'(x) = 1$

71. $f'(x) = \frac{-20\sin(\ln(5x))\arctan^3(\cos(\ln(5x)))}{x(1+\cos^2(\ln(5x)))}$

72. $f'(x) = 5x(x^3 + x^2 + 2)^4(3x+2)$

73. $f'(x) = \frac{1}{\sqrt{1-x^2}\arcsin(x)}$

74. $f'(x) = e^{3x}\sec^2(e^{3x})$

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

76. $f'(x) = 2xe^{x^2}$

77. $f'(x) = 2\cos(2x)\cos(3x) - 3\sin(2x)\sin(3x).$

78. $f'(x) = \frac{-5(4x^3+1)}{6\sqrt[6]{(x^4+x)^{11}}}$

79. $f'(x) = \frac{20\ln^3(3x^5)}{x}$

80. $f'(x) = 5x^4\sec^2(x^5)$

81. $f'(x) = -\frac{2}{5}\left(x^{\frac{1}{2}} + x^{\frac{1}{3}}\right)^{-\frac{7}{5}}\left(\frac{1}{2}x^{-\frac{1}{2}} + \frac{1}{3}x^{-\frac{2}{3}}\right)$

82. $f'(x) = \frac{3\ln^2(5x)}{x}$

83. $f'(x) = 12\cos(3x)\tan^3\left(\ln\left(e^{\sin(3x)}\right)\right)\sec^2\left(\ln\left(e^{\sin(3x)}\right)\right)$

84. $f'(x) = \frac{-6x}{(x^2+2)^4}$

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

86. $f'(x) = 1$

87. $f'(x) = \frac{\sec^2(x)}{\sqrt{1-\tan^2(x)}}$

88. $f'(x) = \frac{1}{x\ln(x)}$

89. $f'(x) = \frac{3\arcsin^2(x)}{\sqrt{1-x^2}}$

90. $f'(x) = \frac{2\ln(x)}{x}$

91. $f'(x) = 9x^2(x^3+1)^2(5+x^2)^4 + 8x(x^3+1)^3(5+x^2)^3$

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

93. $f'(x) = 2x\cos(x^2)$

94. $f'(x) = 20x^4\tan^3(x^5)\sec^2(x^5)$

95. $f'(x) = -\frac{1}{2}e^{2x}(2-3e^x)(e^{2x}-e^{3x})^{-\frac{3}{2}}$

96. $f'(x) = \frac{-e^x}{\sqrt{1-e^{2x}}}$

97. $f'(x) = \frac{x(3x+2)}{4\sqrt[4]{(x^3+x^2+4)^3}}$

98. $f'(x) = 8x(x^2+3)^3(x^2+2)^{\frac{3}{2}} + 3x(x^2+3)^4(x^2+2)^{\frac{1}{2}}$

99. $f'(x) = \frac{4}{3}\left(x^{\frac{5}{3}} + x^{\frac{9}{10}}\right)^{\frac{1}{3}}\left(\frac{5}{3}x^{\frac{2}{3}} + \frac{9}{10}x^{-\frac{1}{10}}\right)$

100. $f'(x) = \frac{2\arctan(x)}{1+x^2}$

101. $f'(x) = \cos(x)$