微分

1. $y = 5x^3$

$y' = 5 \cdot 3x^{3-1} = 15x^2$ #

2. $y = \frac{2}{x} = 2 \cdot x^{-1}$

$y' = 2 \cdot (-1) x^{-1-1} = -2x^{-2}$ # $= \frac{-2}{x^2}$

3. $f(t) = \frac{4t^2}{5} = \frac{4}{5} t^2$

$f'(t) = \frac{4}{5} \cdot 2t^{2-1} = \frac{4}{5} \cdot 2t = \frac{8t}{5}$ #

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

$y' = 2 \cdot \frac{1}{2} x^{\frac{1}{2}-1} = x^{\frac{-1}{2}}$ # $= \frac{1}{\sqrt{x}}$

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

$y' = \frac{1}{2} \cdot (\frac{-2}{3}) x^{\frac{-2}{3}-1} = \frac{-1}{3} x^{\frac{-5}{3}}$ # $= \frac{-1}{3\sqrt[3]{x^5}}$

6. $y = -\frac{3x}{2} = \frac{-3}{2} x$

$y' = \frac{-3}{2} \cdot 1x^{1-1} = \frac{-3}{2} \cdot x^0 = \frac{-3}{2}$ #

7. $y = \frac{5}{2x^3} = \frac{5}{2} x^{-3}$

$y' = \frac{5}{2} \cdot (-3) x^{-3-1} = \frac{5}{2} \cdot (-3) x^{-4} = \frac{-15}{2} x^{-4}$ # $= \frac{-15}{2x^4}$

8. $y = \frac{5}{(2x)^3} = \frac{5}{8} x^{-3}$

$y' = \frac{5}{8} \cdot (-3) x^{-3-1} = \frac{-15}{8} x^{-4}$ # $= \frac{-15}{8x^4}$

9. $y = \frac{7}{3x^{-2}} = \frac{7}{3} x^2$

$y' = \frac{7}{3} \cdot 2x^{2-1} = \frac{14}{3} x$ #

10. $y = \frac{7}{(3x)^{-2}} = 63x^2$

$y' = 63 \cdot 2x^{2-1} = 126x$ #

11. $f(x) = x^3 - 4x + 5$

$f'(x) = 3x^2 - 4$. #

12. $g(x) = -\frac{x^4}{2} + 3x^3 - 2x = \frac{-1}{2}x^4 + 3x^3 - 2x$

$g'(x) = -2x^3 + 9x^2 - 2$. #

13. $y = \frac{3x^2 - x + 1}{x} = 3x - 1 + \frac{1}{x} = 3x - 1 + x^{-1}$

$y' = 3 - x^{-2} = 3 - \frac{1}{x^2}$. #

14. $\cos x - \frac{\pi}{3}\sin x = y = \cos x - \frac{1}{3}\pi \sin x$

$y' = -\sin x - \frac{1}{3}\pi \cos x$. #

15. $y = 2\sin x$

$y' = 2\cos x$. #

16. $y = \frac{\sin x}{2} = \frac{1}{2}\sin x$

$y' = \frac{1}{2}\cos x$. #

17. $y = x + \cos x$

$y' = 1 + (-\sin x) = 1 - \sin x$. #

18. $\cos x - \frac{\pi}{3}\sin x = y = \cos x - \frac{1}{3}\pi \sin x$

$y' = -\sin x - \frac{1}{3}\pi \cos x$. #

19. $y = 12$

$y' = 0$ #

20. $f(x) = -9$

$f'(x) = 0$ #

21. $y = x^{12}$

$y' = 12x^{11}$. #

22. $y = x^{-9}$

$y' = -9x^{-10}$. # $= \frac{-9}{x^{10}}$.

23. $y = \frac{1}{x^5} = x^{-5}$

$y' = -5x^{-6}$. # $= \frac{-5}{x^6}$.

24. $y = \frac{3}{x^7} = 3x^{-7}$

$y' = -21x^{-8}$. # $= \frac{-21}{x^8}$.

25. $g(x) = \sqrt[5]{x} = x^{\frac{1}{5}}$

$g'(x) = \frac{1}{5}x^{\frac{-4}{5}}$. # $= \frac{1}{5\sqrt[5]{x^4}}$.

26. $f(x) = 3\sqrt[7]{x} = 3x^{\frac{1}{7}}$

$f'(x) = \frac{3}{7}x^{\frac{-6}{7}}$. # $= \frac{3}{7\sqrt[7]{x^6}}$.

27. $g(x) = 6x + 3$

$g'(x) = 6$. #

28. $f(x) = x + 11$

$f'(x) = 1$. #

29. $y = t^2 - t + 1$

$y' = 2t - 1$. #

30. $f(t) = -2t^2 + 3t - 6$

$f'(t) = -4t + 3$. #

31. $y = 4x - 3x^3$

$y' = 4 - 9x^2$. #

32. $g(x) = x^2 - 4x^3$

$g'(x) = 2x - 12x^2$. #

33. $f(x) = 2x^3 + 6x^2 - 1$

$f'(x) = 6x^2 + 12x$. #

34. $s(t) = t^3 - 3t + 8$

$s'(t) = 3t^2 - 3$. #

35. $g(t) = \pi \cos t$

$g'(t) = \pi \cdot (-\sin t) = -\pi \sin t$. #

36. $y = \frac{\pi}{2} \sin\theta - \cos\theta$

$y' = \frac{\pi}{2}\cos\theta - (-\sin\theta) = \frac{\pi}{2}\cos\theta + \sin\theta$. #

37. $y = \cancel{7} + \sin x$

$y' = \cos x$. #

38. $y = x^2 - 2\cos x$

$y' = 2x - 2\cdot(-\sin x) = 2x + 2\sin x$. #

39. $y = \frac{1}{x} - 3\sin x = x^{-1} - 3\sin x$

$y' = -x^{-2} - 3\cos x = \frac{-1}{x^2} - 3\cos x$. #

40. $y = \frac{5}{x^3} + 2\cos x = 5x^{-3} + 2\cos x$

$y' = -15x^{-4} + 2\cdot(-\sin x) = \frac{-15}{x^4} - 2\sin x$. #

41. $f(x) = \frac{8}{x^2} = 8x^{-2}$

$f'(x) = -16x^{-3}$. # $= \frac{-16}{x^3}$.

42. $f(t) = 2 - \frac{4}{t} = 2 - 4t^{-1}$

$f'(t) = 4t^{-2}$. # $= \frac{4}{t^2}$

43. $y = 2x^4 - 3$

$y' = 8x^3$. #

44. $f(x) = -2 + 7x^3$

$f'(x) = 21x^2$. #

45. $y = (4x+1)^2$

$y' = 2(4x+1)^{2-1}(4x+1)' = 2(4x+1)\cdot 4 = 8(4x+1)$. #

46. $f(x) = 2(x-4)^2$

$f'(x) = 2\cdot 2(x-4)^{2-1}\cdot(x-4)' = 4(x-4)\cdot 1 = 4(x-4)$. #

47. $g(t) = -2\cos t + 5$

$g'(t) = -2\cdot(-\sin t) = 2\sin t$. #

48. $f(\theta) = 4\sin\theta - \theta$

$f'(\theta) = 4\cos\theta - 1$. #

49. $f(x) = x^2 + 5 - 3x^{-2}$

$f'(x) = 2x + 6x^{-3}$. # $= 2x + \frac{6}{x^3}$.

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

$f'(x) = 3x^2 - 2 - 9x^{-4}$. # $= 3x^2 - 2 - \frac{9}{x^4}$.

51. $f(x) = 8x + \frac{3}{x^2} = 8x + 3x^{-2}$

$f'(x) = 8 - 6x^{-3}$. # $= 8 - \frac{6}{x^3}$.

52. $g(t) = t^2 - \frac{4}{t^3} = t^2 - 4t^{-3}$

$g'(t) = 2t + 12t^{-4}$. # $= 2t + \frac{12}{t^4}$.

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

$f'(x) = \frac{x^2 \cdot (4x^3+3x)' - (x^2)' \cdot (4x^3+3x)}{(x^2)^2} = \frac{x^2(12x^2+3) - 2x(4x^3+3x)}{x^4} = \frac{4x^4 - 3x^2}{x^4}$. #

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

$f'(x) = \frac{x^3 \cdot (2x^4-x)' - (x^3)' \cdot (2x^4-x)}{(x^3)^2} = \frac{x^3(8x^3-1) - 3x^2(2x^4-x)}{x^6} = \frac{2x^6+2x^3}{x^6}$. #

55. $h(x) = \frac{4x^3+2x+5}{x}$

$h'(x) = \frac{x \cdot (4x^3+2x+5)' - (x)'(4x^3+2x+5)}{x^2} = \frac{x(12x^2+2) - (4x^3+2x+5)}{x^2} = \frac{8x^3-5}{x^2}$. #

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

$f'(x) = \frac{x^2 \cdot (x^3-3x^2+4)' - (x^2)'(x^3-3x^2+4)}{(x^2)^2} = \frac{x^2(3x^2-6x) - 2x(x^3-3x^2+4)}{x^4} = \frac{x^4-8x}{x^4}$. #

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

$y' = (x^2)' \cdot (2x-3) + x^2 \cdot (2x-3)' = 2x(2x-3) + x^2 \cdot 2 = 4x^2 - 6x + 2x^2 = 6x^2 - 6x = 6x(x-1)$. #

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

$y' = (x)' \cdot (x^2+1) + x \cdot (x^2+1)' = 1 \cdot (x^2+1) + x \cdot (2x) = x^2 + 1 + 2x^2 = 3x^2 + 1$. #

59. $f(t) = t^{2/3} - t^{1/3} + 4$

$f'(t) = \frac{2}{3}t^{\frac{-1}{3}} - \frac{1}{3}t^{\frac{-2}{3}}$. # $= \frac{2}{3\sqrt[3]{t}} - \frac{1}{3\sqrt[3]{t^2}}$.

60. $f(x) = \sqrt{x} - 6\sqrt[3]{x} = x^{\frac{1}{2}} - 6x^{\frac{1}{3}}$

$f'(x) = \frac{1}{2}x^{\frac{-1}{2}} - 2x^{\frac{-2}{3}}$. # $= \frac{1}{2\sqrt{x}} - \frac{2}{\sqrt[3]{x^2}}$.

61. $f(x) = 6\sqrt{x} + 5\sin x = 6x^{\frac{1}{2}} + 5\sin x$

$f'(x) = 3x^{\frac{-1}{2}} + 5\cos x$. # $= \frac{3}{\sqrt{x}} + 5\cos x$.

62. $f(x) = \frac{2}{\sqrt[3]{x}} + 3\cos x = 2x^{\frac{-1}{3}} + 3\cos x$

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

63. $g(x) = (x^2+3)(x^2-4)$

$g'(x) = (x^2+3)'(x^2-4) + (x^2+3)(x^2-4)' = 2x(x^2-4) + (x^2+3)\cdot(2x) = 4x^3 - 2x = x(4x^2-2)$. #

64. $y = (3x-4)(x^3+5)$

$y' = (3x-4)'(x^3+5) + (3x-4)(x^3+5)' = 3(x^3+5) + (3x-4)\cdot(3x^2) = 12x^3 - 12x^2 + 15 = 3(4x^3 - 4x^2 + 5)$. #

65. $g(s) = \sqrt{s}(s^2+8) = s^{\frac{1}{2}}(s^2+8)$

$g'(s) = (s^{\frac{1}{2}})'(s^2+8) + s^{\frac{1}{2}}\cdot(s^2+8)' = \frac{1}{2}s^{\frac{-1}{2}}(s^2+8) + s^{\frac{1}{2}}(2s) = \frac{5}{2}s^{\frac{3}{2}} + 4s^{\frac{-1}{2}}$. # $= \frac{5\sqrt{s^3}}{2} + \frac{4}{\sqrt{s}}$.

66. $h(t) = \sqrt{t}(1-t^2) = t^{\frac{1}{2}}(1-t^2)$

$h'(t) = (t^{\frac{1}{2}})'(1-t^2) + t^{\frac{1}{2}}\cdot(1-t^2)' = \frac{1}{2}t^{\frac{-1}{2}}(1-t^2) + t^{\frac{1}{2}}\cdot(-2t) = \frac{1}{2}t^{\frac{-1}{2}} - \frac{5}{2}t^{\frac{3}{2}}$. # $= \frac{1}{2\sqrt{t}} - \frac{5\sqrt{t^3}}{2}$.

67. $g(x) = \sqrt{x}\sin x = x^{\frac{1}{2}}\cdot\sin x$

$g'(x) = (x^{\frac{1}{2}})'\cdot\sin x + x^{\frac{1}{2}}\cdot(\sin x)' = \frac{1}{2}x^{\frac{-1}{2}}\cdot\sin x + x^{\frac{1}{2}}\cos x = \frac{1}{2\sqrt{x}}\sin x + \sqrt{x}\cos x$. #

68. $f(x) = x^2\cos x$

$f'(x) = (x^2)'\cdot\cos x + x^2\cdot(\cos x)' = 2x\cos x + x^2\cdot(-\sin x) = 2x\cos x - x^2\sin x$. #

69. $f(x) = \frac{x}{x+1}$

$f'(x) = \frac{(x+1)(x)' - (x+1)'\cdot x}{(x+1)^2} = \frac{(x+1)\cdot 1 - 1\cdot x}{(x+1)^2} = \frac{1}{(x+1)^2}$. #

70. $g(t) = \frac{3t^2-1}{2t+5}$

$g'(t) = \frac{(2t+5)\cdot(3t^2-1)' - (2t+5)'\cdot(3t^2-1)}{(2t+5)^2} = \frac{(2t+5)\cdot 6t - 2(3t^2-1)}{(2t+5)^2} = \frac{6t^2+30t+2}{(2t+5)^2}$. #

71. $f(x)=\frac{x^2}{2\sqrt{x}} = \frac{x^2}{2\cdot x^{\frac{1}{2}}}$

$$f'(x)=\frac{2x^{\frac{1}{2}}\cdot(x^2)'-(2x^{\frac{1}{2}})'\cdot x^2}{(2x^{\frac{1}{2}})^2} = \frac{2x^{\frac{1}{2}}\cdot 2x - x^{\frac{-1}{2}}\cdot x^2}{4x} = \frac{3x^{\frac{3}{2}}}{4x} = \frac{3}{4}x^{\frac{1}{2}}.\#\ = \frac{3\sqrt{x}}{4}.$$

72. $h(x)=\frac{\sqrt{x}}{x^3+1} = \frac{x^{\frac{1}{2}}}{x^3+1}$

$$h'(x)=\frac{(x^3+1)\cdot(x^{\frac{1}{2}})'-(x^3+1)'\cdot x^{\frac{1}{2}}}{(x^3+1)^2} = \frac{(x^3+1)\cdot(\frac{1}{2}x^{\frac{-1}{2}})-3x^2\cdot x^{\frac{1}{2}}}{(x^3+1)^2} = \frac{\frac{-5}{2}x^{\frac{5}{2}}+\frac{1}{2}x^{\frac{-1}{2}}}{(x^3+1)^2} = \frac{-5x^{\frac{5}{2}}+x^{\frac{-1}{2}}}{2(x^3+1)^2}.\#$$

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

73. $g(x)=\frac{\sin x}{x}$

$$g'(x)=\frac{x\cdot(\sin x)'-(x)'\cdot\sin x}{x^2} = \frac{x\cos x-\sin x}{x^2}.\#$$

74. $f(t)=\frac{\cos t}{t^3}$

$$f'(t)=\frac{t^3\cdot(\cos t)'-(t^3)'\cdot\cos t}{(t^3)^2} = \frac{-t^3\sin t-3t^2\cos t}{t^6} = \frac{-t\sin t-3\cos t}{t^4}.\#$$

75. $f(x)=(x^2+4)(3x^2-5)$

$$f'(x)=(x^2+4)'(3x^2-5)+(x^2+4)(3x^2-5)'=2x(3x^2-5)+6x(x^2+4)=12x^3+14x=2x(6x^2+7).\#$$

76. $y=(x^2+2)(x^3+1)$

$$y'=(x^2+2)'(x^3+1)+(x^2+2)(x^3+1)'=2x(x^3+1)+3x^2(x^2+2)=5x^4+6x^2+2x=x(5x^3+6x+2).\#$$

77. $f(x)=\frac{x-4}{x-3}$

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

78. $f(x)\frac{x^2-4}{x-3}$

$$f'(x)=\frac{(x-3)(x^2-4)'-(x-3)'(x^2-4)}{(x-3)^2}=\frac{2x(x-3)-(x^2-4)}{(x-3)^2}=\frac{x^2-6x+4}{(x-3)^2}.\#$$

79. $f(x)=\frac{\sin x}{x^2}$

$$f'(x)=\frac{x^2(\sin x)'-(x^2)'\sin x}{(x^2)^2}=\frac{x^2\cos x-2x\sin x}{x^4}=\frac{x\cos x-2\sin x}{x^3}.\#$$

80. $f(x)=x\cos x$

$$f'(x)=(x)'\cdot\cos x+x\cdot(\cos x)'=\cos x-x\sin x.\#$$

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

$$f'(x)=\frac{(x^2-1)(4-3x-x^2)'-(x^2-1)'(4-3x-x^2)}{(x^2-1)^2}=\frac{(x^2-1)(-3-2x)-2x(4-3x-x^2)}{(x^2-1)^2}=\frac{3x^2-6x+3}{(x^2-1)^2}=\frac{3(x-1)^2}{(x+1)^2(x-1)^2}$$

$$=\frac{3}{(x+1)^2}.\#$$

82. $f(x)=\frac{x^2+5x+6}{x^2-4}$

$$f'(x)=\frac{(x^2-4)(x^2+5x+6)'-(x^2-4)'(x^2+5x+6)}{(x^2-4)^2}=\frac{(x^2-4)(2x+5)-2x(x^2+5x+6)}{(x^2-4)^2}=\frac{-5x^2-20x-20}{(x^2-4)^2}=\frac{-5(x+2)^2}{(x+2)^2(x-2)^2}$$

$$=\frac{-5}{(x-2)^2}.\#$$

83. $f(x)=x\left(1-\frac{4}{x+3}\right)$

$$f'(x)=(x)'\left(1-\frac{4}{x+3}\right)+x\left(1-\frac{4}{x+3}\right)'=\left(1-\frac{4}{x+3}\right)+x\left(\frac{(x+3)\cdot(-4)'-(x+3)'\cdot(-4)}{(x+3)^2}\right)=1-\frac{4}{x+3}+\frac{4x}{(x+3)^2}=\frac{x^2+6x-3}{(x+3)^2}.\#$$

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

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

$$=4x^3-\frac{8x^3}{x+1}+\frac{2x^4}{(x+1)^2}$$

$$=\frac{2x^3(2x^2+x-2)}{(x+1)^2}\ \#$$

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

$f'(x) = (x^{\frac{1}{3}})'(x^{\frac{1}{2}}+3) + x^{\frac{1}{3}}(x^{\frac{1}{2}}+3)' = \frac{1}{3}x^{\frac{-2}{3}}(x^{\frac{1}{2}}+3) + x^{\frac{1}{3}}\cdot\frac{1}{2}x^{\frac{-1}{2}} = \frac{5}{6}x^{\frac{-1}{6}} + x^{\frac{-2}{3}}$ #

$= \frac{5}{6\sqrt[6]{x}} + \frac{1}{\sqrt[3]{x^2}}$.

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

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

$= \frac{3x+1}{2\sqrt{x}}$.

87. $h(x) = (x^2+3)^3$

$h'(x) = 3(x^2+3)^2\cdot(x^2+3)' = 3(x^2+3)^2\cdot(2x) = 6x(x^2+3)^2$. #

88. $h(s) = (s^3-2)^2$

$h'(s) = 2(s^3-2)\cdot(s^3-2)' = 2(s^3-2)\cdot(3s^2) = 6s^2(s^3-2)$. #

89. $g(x) = x^2\left(\frac{2}{x} - \frac{1}{x+1}\right) = 2x - \frac{x^2}{x+1}$

$g'(x) = (2x)' - \left(\frac{x^2}{x+1}\right)' = 2 - \frac{(x+1)\cdot(x^2)' - (x+1)'\cdot x^2}{(x+1)^2} = 2 - \frac{2x(x+1) - x^2}{(x+1)^2} = 2 - \frac{x^2+2x}{(x+1)^2} = 2 - \frac{x(x+2)}{(x+1)^2}$. #

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

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

91. $f(x) = (2x^3+5x)(x-3)(x+2) = (2x^3+5x)(x^2-x-6)$

$f'(x) = (2x^3+5x)'(x^2-x-6) + (2x^3+5x)(x^2-x-6)' = (6x^2+5)(x^2-x-6) + (2x^3+5x)(2x-1)$

$= 10x^4 - 8x^3 - 21x^2 - 10x - 30$. #

92. $f(x) = (x^3-x)(x^2+2)(x^2-1) = (x^3-x)(x^4+x^2-2)$

$f'(x) = (x^3-x)'(x^4+x^2-2) + (x^3-x)(x^4+x^2-2)' = (3x^2-1)(x^4+x^2-2) + (x^3-x)(4x^3+2x)$

$= 7x^6 - 9x^2 + 2$. #

93. $f(x) = \frac{c^2-x^2}{c^2+x^2}$

$f'(x) = \frac{(c^2+x^2)(c^2-x^2)' - (c^2+x^2)'(c^2-x^2)}{(c^2+x^2)^2} = \frac{(c^2+x^2)\cdot(-2x) - 2x(c^2-x^2)}{(c^2+x^2)^2} = \frac{-4c^2x}{(c^2+x^2)^2}$ #

94. $f(x) = \frac{x^2+c^2}{x^2-c^2}$

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

95. $f(t) = t^2 \sin t$

$f'(t) = (t^2)'\sin t + t^2\cdot(\sin t)' = 2t\sin t + t^2\cos t.$ #

96. $f(\theta) = (\theta+1)\cos\theta$

$f'(\theta) = (\theta+1)'\cos\theta + (\theta+1)\cdot(\cos\theta)' = \cos\theta + (\theta+1)\cdot(-\sin\theta) = \cos\theta - (\theta+1)\sin\theta.$ #

97. $f(x) = \frac{\sin x}{x^3}$

$f'(x) = \frac{x^3\cdot(\sin x)' - (x^3)'\sin x}{(x^3)^2} = \frac{x^3\cos x - 3x^2\sin x}{x^6} = \frac{x\cos x - 3\sin x}{x^4}.$ #

98. $f(t) = \frac{\cos t}{t}$

$f'(t) = \frac{t\cdot(\cos t)' - (t)'\cdot\cos t}{t^2} = \frac{t\cdot(-\sin t) - \cos t}{t^2} = \frac{-t\sin t - \cos t}{t}.$ #

99. $f(x) = -x + \tan x$

$f'(x) = (-x)' + (\tan x)' = -1 + \sec^2 x.$ #

100. $y = x + \cot x$

$y' = (x)' + (\cot x)' = 1 + (-\csc^2 x) = 1 - \csc^2 x.$ #

101. $g(t) = \sqrt[4]{t} + 6\csc t = t^{\frac{1}{4}} + 6\csc t$

$g'(t) = (t^{\frac{1}{4}})' + (6\csc t)' = \frac{1}{4}t^{\frac{-3}{4}} + 6\cdot(-\csc x\cot x) = \frac{1}{4}t^{\frac{-3}{4}} - 6\csc x\cot x.$ #

$= \frac{1}{4\sqrt[4]{t^3}} - 6\csc x\cot x.$

102. $h(x) = \frac{1}{x} - 12\sec x = x^{-1} - 12\sec x$

$h'(x) = (x^{-1})' - (12\sec x)' = -x^{-2} - 12\sec x\tan x.$ #

$= \frac{-1}{x^2} - 12\sec x\tan x.$

103. $y = \frac{1-\sin x}{\cos x}$

$$y' = \frac{\cos x \cdot (1-\sin x)' - (\cos x)' \cdot (1-\sin x)}{\cos^2 x} = \frac{-\cos^2 x + \sin x(1-\sin x)}{\cos^2 x} = \frac{\sin x - (\sin^2 x + \cos^2 x)}{\cos^2 x}$$

$$= \frac{\sin x - 1}{\cos^2 x}. \#$$

104. $y = \frac{\sec x}{x}$

$$y' = \frac{x \cdot (\sec x)' - (x)' \cdot \sec x}{x^2} = \frac{x\sec x \tan x - \sec x}{x^2} = \frac{\sec x(x\tan x - 1)}{x^2}. \#$$

105. $y = -\csc x - \sin x$

$$y' = \csc x \cot x - \cos x \ \#$$

106. $y = x\sin x + \cos x$

$$y' = (x\sin x)' + (\cos x)' = (\sin x + x\cos x) + (-\sin x) = x\cos x. \#$$

107. $f(x) = \sin x \cos x$

$$f'(x) = (\sin x)' \cdot \cos x + \sin x \cdot (\cos x)' = \cos^2 x - \sin^2 x = 1 - \sin^2 x - \sin^2 x = 1 - 2\sin^2 x. \#$$

108. $f(x) = x^2 \tan x$

$$f'(x) = (x^2)' \cdot \tan x + x^2 \cdot (\tan x)' = 2x\tan x + x^2\sec^2 x = 2x\tan x + x^2(\tan^2 x + 1)$$

$$= x^2\tan^2 x + 2x\tan x + x^2. \#$$

109. $h(\theta) = 5\theta \sec\theta + \theta\tan\theta$

$$h'(\theta) = (5\theta\sec\theta)' + (\theta\tan\theta)' = (5\sec\theta + 5\theta\sec\theta\tan\theta) + (\tan\theta + \theta\sec^2\theta)$$

$$= \theta\sec^2\theta + 5\sec\theta + 5\theta\sec\theta\tan\theta + \tan\theta. \#$$

110. $y = 2x\sin x + x^2\cos x$

$$y' = (2x\sin x)' + (x^2\cos x)' = (2\sin x + 2x\cos x) + (2x\cos x - x^2\sin x)$$

$$= (-x^2+2)\sin x + 4x\cos x. \#$$

111. $f(x) = x^4 + 2x^3 - 3x^2 - x$

$$f'(x) = 4x^3 + 6x^2 - 6x - 1. \#$$

112. $f(x) = 4x^5 - 2x^3 + 5x^2$

$f'(x) = 20x^4 - 6x^2 + 10x$. #

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

$f'(x) = 2x - 9x^{-4}$. # $= 2x - \frac{9}{x^4}$.

114. $f(x) = 4x^{3/2}$

$f'(x) = 6x^{\frac{1}{2}}$. # $= 6\sqrt{x}$.

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

$f'(x) = \frac{(x-4)\cdot(x^2+3x)' - (x-4)'\cdot(x^2+3x)}{(x-4)^2} = \frac{(x-4)(2x+3) - (x^2+3x)}{(x-4)^2} = \frac{x^2-8x-12}{(x-4)^2}$. #

116. $f(x) = \frac{x}{x-1}$

$f'(x) = \frac{(x-1)\cdot(x)' - (x-1)'\cdot x}{(x-1)^2} = \frac{(x-1) - x}{(x-1)^2} = \frac{-1}{(x-1)^2}$. #

117. $f(x) = sec\, x = \frac{1}{\cos x}$

$f'(x) = \frac{\cos x\cdot(1)' - (\cos x)'\cdot 1}{\cos^2 x} = \frac{\sin x}{\cos^2 x} = \frac{1}{\cos x}\cdot\frac{\sin x}{\cos x} = \sec x \tan x$. #

118. $f(x) = x \sin x$

$f'(x) = (x)'\sin x + x\cdot(\sin x)' = \sin x + x\cos x$. #

119. $y = \cos 3x^2$

$y' = -\sin 3x^2 \cdot (3x^2)' = -\sin 3x^2 \cdot (6x) = -6x \sin 3x^2$. #

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

$y' = (2\cos 3)x$ #

121. $y = \cos(3x)^2 = \cos 9x^2$

$y' = -\sin 9x^2 \cdot (9x^2)' = -18x\sin 9x^2$. #

122. $y = \cos^2 x$

$y' = 2\cos x \cdot (\cos x)' = 2\cos x \cdot (-\sin x) = -2\cos x \sin x$. #

123. $y = \sqrt{\cos x} = \cos^{\frac{1}{2}} x$

$y' = \frac{1}{2}\cos^{\frac{-1}{2}} x \cdot (\cos x)' = \frac{1}{2}\cos^{\frac{-1}{2}} x \cdot (-\sin x) = \frac{-1}{2}\cos^{\frac{-1}{2}} x \sin x$. # $= \frac{-\sin x}{2\sqrt{\cos x}}$

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

$y' = 3(4x-1)^2 \cdot (4x-1)' = 3(4x-1)^2 \cdot 4 = 12(4x-1)^2$. #

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

$y' = 20(2-x^3)^3 \cdot (2-x^3)' = 20(2-x^3)^3 \cdot (-3x^2) = -60x^2(2-x^3)^3$. #

126. $g(x) = 3(4-9x)^4$

$g'(x) = 12(4-9x)^3 \cdot (4-9x)' = 12(4-9x)^3 \cdot (-9) = -108(4-9x)^3$. #

127. $f(t) = (9t+2)^{2/3}$

$f'(t) = \frac{2}{3}(9t+2)^{\frac{-1}{3}} \cdot (9t+2)' = 6(9t+2)^{\frac{-1}{3}}$. # $= \frac{6}{\sqrt[3]{9t+2}}$

128. $g(x) = \sqrt{4-x^2} = (4-x^2)^{\frac{1}{2}}$

$g'(x) = \frac{1}{2}(4-x^2)^{\frac{-1}{2}} \cdot (4-x^2)' = -x(4-x^2)^{\frac{-1}{2}}$. # $= \frac{-x}{\sqrt{4-x^2}}$

129. $f(t) = \sqrt{5-t} = (5-t)^{\frac{1}{2}}$

$f'(t) = \frac{1}{2}(5-t)^{\frac{-1}{2}} \cdot (5-t)' = \frac{-1}{2}(5-t)^{\frac{-1}{2}}$. # $= \frac{-1}{2\sqrt{5-t}}$

130. $f(x) = \sqrt{x^2+4x+6} = (x^2+4x+6)^{\frac{1}{2}}$

$f'(x) = \frac{1}{2}(x^2+4x+6)^{\frac{-1}{2}} \cdot (x^2+4x+6)' = \frac{1}{2}(2x+4)(x^2+4x+6)^{\frac{-1}{2}} = (x+2)(x^2+4x+6)^{\frac{-1}{2}}$. # $= \frac{x+2}{\sqrt{x^2+4x+6}}$

131. $y = \sqrt[3]{6x^2+1} = (6x^2+1)^{\frac{1}{3}}$

$y' = \frac{1}{3}(6x^2+1)^{\frac{-2}{3}} \cdot (6x^2+1)' = 4x(6x^2+1)^{\frac{-2}{3}}$. # $= \frac{4x}{\sqrt[3]{(6x^2+1)^2}}$

132. $f(x) = \sqrt[3]{12x-5} = (12x-5)^{\frac{1}{3}}$

$f'(x) = \frac{1}{3}(12x-5)^{\frac{-2}{3}} \cdot (12x-5)' = 4(12x-5)^{\frac{-2}{3}}$. # $= \frac{4}{\sqrt[3]{(12x-5)^2}}$

133. $y = 2\sqrt[4]{9-x^2} = 2(9-x^2)^{\frac{1}{4}}$

$y' = \frac{1}{2}(9-x^2)^{\frac{-3}{4}} \cdot (9-x^2)' = -x(9-x^2)^{\frac{-3}{4}}$. # $= \frac{-x}{\sqrt[4]{(9-x^2)^3}}$

134. $y = \frac{1}{x-2} = (x-2)^{-1}$

$y' = -(x-2)^{-2} \cdot (x-2)' = -(x-2)^{-2}$. # $= \frac{-1}{(x-2)^2}$.

135. $s(t) = \frac{1}{4-5t-t^2} = (4-5t-t^2)^{-1}$

$s'(t) = -(4-5t-t^2)^{-2} \cdot (4-5t-t^2)' = -(4-5t-t^2)^{-2} \cdot (-5-2t) = (2t+5)(4-5t-t^2)^{-2}$. # $= \frac{2t+5}{(4-5t-t^2)^2}$.

136. $y = -\frac{3}{(t-2)^4} = -3(t-2)^{-4}$

$y' = 12(t-2)^{-5} \cdot (t-2)' = 12(t-2)^{-5}$. # $= \frac{12}{(t-2)^5}$.

137. $f(t) = \left(\frac{1}{t-3}\right)^2 = (t-3)^{-2}$

$f'(t) = -2(t-3)^{-3} \cdot (t-3)' = -2(t-3)^{-3}$. # $= \frac{-2}{(t-3)^3}$.

138. $g(t) = \frac{1}{\sqrt{t^2-2}} = (t^2-2)^{\frac{-1}{2}}$

$g'(t) = \frac{-1}{2}(t^2-2)^{\frac{-3}{2}} \cdot (t^2-2)' = \frac{-1}{2}(t^2-2)^{\frac{-3}{2}} \cdot (2t) = -t(t^2-2)^{\frac{-3}{2}}$. # $= \frac{-t}{\sqrt{(t^2-2)^3}}$.

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

$y' = \frac{-1}{2}(3x+5)^{\frac{-3}{2}} \cdot (3x+5)' = \frac{-3}{2}(3x+5)^{\frac{-3}{2}}$. # $= \frac{-3}{2\sqrt{(3x+5)^3}}$.

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

$f'(x) = (x)' \cdot (2x-5)^3 + x \cdot [(2x-5)^3]' = (2x-5)^3 + x \cdot 3(2x-5)^2 \cdot (2x-5)' = (2x-5)^3 + 6x(2x-5)^2$

$= (2x-5)^2(8x-5)$. #

141. $f(x) = x^2(x-2)^4$

$f'(x) = (x^2)' \cdot (x-2)^4 + x^2 \cdot [(x-2)^4]' = 2x(x-2)^4 + x^2 \cdot 4(x-2)^3 \cdot (x-2)' = 2x(x-2)^4 + 4x^2(x-2)^3$

$= (x-2)^3(6x^2-4x)$

$= 2x(x-2)^3(3x-2)$. #

142. $y = x\sqrt{1-x^2} = x(1-x^2)^{\frac{1}{2}}$

$y' = (x)' \cdot (1-x^2)^{\frac{1}{2}} + x \cdot [(1-x^2)^{\frac{1}{2}}]' = (1-x^2)^{\frac{1}{2}} + x \cdot \frac{1}{2}(1-x^2)^{\frac{-1}{2}} \cdot (1-x^2)'$

$= (1-x^2)^{\frac{1}{2}} - x^2(1-x^2)^{\frac{-1}{2}} = (1-x^2)^{\frac{-1}{2}}(1-2x^2)$. # $= \frac{1-2x^2}{\sqrt{1-x^2}}$.

143. $y = \frac{1}{2}x^2\sqrt{16-x^2}$

$= \frac{1}{2}x^2(16-x^2)^{\frac{1}{2}}$

$y' = (\frac{1}{2}x^2)' \cdot (16-x^2)^{\frac{1}{2}} + (\frac{1}{2}x^2) \cdot [(16-x^2)^{\frac{1}{2}}]' = x(16-x^2)^{\frac{1}{2}} + \frac{1}{4}x^2(16-x^2)^{\frac{-1}{2}} \cdot (16-x^2)'$

$= x(16-x^2)^{\frac{1}{2}} - \frac{1}{2}x^3(16-x^2)^{\frac{-1}{2}}$

$= x(16-x^2)^{\frac{-1}{2}}(16-\frac{3}{2}x^2)$. # $= \frac{x(16-\frac{3}{2}x^2)}{\sqrt{16-x^2}}$

144. $y=\frac{x}{\sqrt{x^2+1}} = \frac{x}{(x^2+1)^{\frac{1}{2}}}$

$$y' = \frac{(x^2+1)^{\frac{1}{2}}\cdot(x)' - [(x^2+1)^{\frac{1}{2}}]'\cdot x}{[(x^2+1)^{\frac{1}{2}}]^2} = \frac{(x^2+1)^{\frac{1}{2}} - \frac{1}{2}x(x^2+1)^{\frac{-1}{2}}\cdot(2x)}{x^2+1} = \frac{(x^2+1)^{\frac{-1}{2}}(x^2+1-x^2)}{x^2+1} = (x^2+1)^{\frac{-3}{2}} \ \#$$

$$= \frac{1}{\sqrt{(x^2+1)^3}}$$

145. $y=\frac{x}{\sqrt{x^4+4}} = \frac{x}{(x^4+4)^{\frac{1}{2}}}$

$$y' = \frac{(x^4+4)^{\frac{1}{2}}\cdot(x)' - [(x^4+4)^{\frac{1}{2}}]'\cdot x}{[(x^4+4)^{\frac{1}{2}}]^2} = \frac{(x^4+4)^{\frac{1}{2}} - \frac{1}{2}x(x^4+4)^{\frac{-1}{2}}\cdot(4x^3)}{x^4+4} = \frac{(x^4+4)^{\frac{-1}{2}}(-x^4+4)}{x^4+4}$$

$$= (x^4+4)^{\frac{-3}{2}}(-x^4+4). \ \# = \frac{-x^4+4}{\sqrt{(x^4+4)^3}}$$

146. $h(t) = \left(\frac{t^2}{t^3+2}\right)^2$

$$h'(t) = 2\left(\frac{t^2}{t^3+2}\right)\cdot\left(\frac{t^2}{t^3+2}\right)' = \frac{2t^2}{t^3+2}\cdot\frac{2t(t^3+2)-3t^2\cdot t^2}{(t^3+2)^2} = \frac{2t^3(-t^3+4)}{(t^3+2)^3}. \ \#$$

147. $g(x) = \left(\frac{x+5}{x^2+2}\right)^2$

$$g'(x) = 2\left(\frac{x+5}{x^2+2}\right)\cdot\left(\frac{x+5}{x^2+2}\right)' = \frac{2x+10}{x^2+2}\cdot\frac{x^2+2-2x(x+5)}{(x^2+2)^2} = \frac{-2(x+5)(x^2+10x-2)}{(x^2+2)^3}. \ \#$$

148. $f(v) = \left(\frac{1-2v}{1+v}\right)^3$

$$f'(v) = 3\left(\frac{1-2v}{1+v}\right)^2\cdot\left(\frac{1-2v}{1+v}\right)' = \frac{3(1-2v)^2}{(1+v)^2}\cdot\frac{-2(1+v)-(1-2v)}{(1+v)^2} = \frac{-9(1-2v)^2}{(1+v)^4}. \ \#$$

149. $g(x) = \left(\frac{3x^2-2}{2x+3}\right)^3$

$$g'(x) = 3\left(\frac{3x^2-2}{2x+3}\right)^2\cdot\left(\frac{3x^2-2}{2x+3}\right)' = \frac{3(3x^2-2)^2}{(2x+3)^2}\cdot\frac{6x(2x+3)-2(3x^2-2)}{(2x+3)^2} = \frac{6(3x^2-2)^2(3x^2+9x+2)}{(2x+3)^4} \ \#$$

150. $g(x) = (2+(x^2+1)^4)^3$

$$g'(x) = 3(2+(x^2+1)^4)^2\cdot(2+(x^2+1)^4)' = 3(2+(x^2+1)^4)^2\cdot 4(x^2+1)^3\cdot(x^2+1)'$$

$$= 3(2+(x^2+1)^4)^2\cdot 8x(x^2+1)^3 = 24x(2+(x^2+1)^4)^2(x^2+1)^3 \ \#$$

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

$$f'(x) = 2((x^2+3)^5+x)\cdot((x^2+3)^5+x)'$$

$$= 2((x^2+3)^5+x)\cdot(5(x^2+3)^4+1)\cdot(x^2+3)'$$

$$= 4x((x^2+3)^5+x)(5(x^2+3)^4+1) \ \#$$

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

$$y' = \frac{(x^2+1)\cdot(x^{\frac{1}{2}}+1)' - (x^2+1)'\cdot(x^{\frac{1}{2}}+1)}{(x^2+1)^2} = \frac{\frac{1}{2}x^{-\frac{1}{2}}(x^2+1) - 2x(x^{\frac{1}{2}}+1)}{(x^2+1)^2} = \frac{\frac{1}{2}x^{-\frac{1}{2}} - \frac{3}{2}x^{\frac{3}{2}} - 2x}{(x^2+1)^2} = \frac{x^{-\frac{1}{2}} - 3x^{\frac{3}{2}} - 4x}{2(x^2+1)^2} \#$$

$$= \frac{1-3x^2-4x\sqrt{x}}{2\sqrt{x}(x^2+1)^2}$$

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

$$y' = \frac{1}{2}\left(\frac{2x}{x+1}\right)^{-\frac{1}{2}} \cdot \left(\frac{2x}{x+1}\right)' = \frac{1}{2}\left(\frac{2x}{x+1}\right)^{-\frac{1}{2}} \cdot \frac{2(x+1)-2x}{(x+1)^2} = \frac{(2x)^{-\frac{1}{2}}\cdot 2}{2(x+1)^{\frac{3}{2}}} = \frac{(2x)^{-\frac{1}{2}}}{(x+1)^{\frac{3}{2}}}. \#$$

$$= \frac{1}{\sqrt{2x(x+1)^3}}$$

154. $g(x) = \sqrt{x-1} + \sqrt{x+1} = (x-1)^{\frac{1}{2}} + (x+1)^{\frac{1}{2}}$

$$g'(x) = \frac{1}{2}(x-1)\cdot 1 + \frac{1}{2}(x+1)\cdot 1 = \frac{x-1+x+1}{2} = x. \#$$

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

$$y' = \frac{1}{2}\left(\frac{x+1}{x}\right)^{-\frac{1}{2}} \cdot \left(\frac{x+1}{x}\right)' = \frac{1}{2}\left(\frac{x+1}{x}\right)^{-\frac{1}{2}} \cdot \left(\frac{x-(x+1)}{x^2}\right) = \frac{(x+1)^{-\frac{1}{2}}}{2x^{\frac{3}{2}}}. \#$$

$$= \frac{1}{2\sqrt{x^3}\sqrt{x+1}} = \frac{1}{2x\sqrt{x(x+1)}}$$

156. $y = \frac{\cos \pi x+1}{x}$

$$y' = \frac{x\cdot(\cos\pi x+1)' - (x)'\cdot(\cos\pi x+1)}{x^2} = \frac{-x\sin\pi x\cdot(\pi x)' - (\cos\pi x+1)}{x^2} = \frac{-\pi x\sin\pi x - \cos\pi x - 1}{x^2}. \#$$

157. $y = x^2 \tan\frac{1}{x} = x^2\tan x^{-1}$

$$y' = (x^2)'\cdot\tan x^{-1} + x^2\cdot(\tan x^{-1})' = 2x\tan x^{-1} + x^2\sec^2 x^{-1}\cdot(x^{-1})' = 2x\tan\frac{1}{x} - \sec^2\frac{1}{x}. \#$$

158. $f(x) = (1-2x)^4$

$$f'(x) = 4(1-2x)^3\cdot(1-2x)' = -8(1-2x)^3. \#$$

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

$$f'(x) = 10(x^3+4)^4\cdot(x^3+4)' = 30x^2(x^3+4)^4. \#$$

160. $f(x) = \frac{8}{(x-2)^2} = 8(x-2)^{-2}$

$$f'(x) = -16(x-2)^{-3}\cdot(x-2)' = \frac{-16}{(x-2)^3}. \#$$

161. $f(x) = \frac{1}{x-6} = (x-6)^{-1}$

$$f'(x) = -(x-6)^{-2}\cdot(x-6)' = \frac{-1}{(x-6)^2}. \#$$

162. $f(x) = \sin x^2$

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

163. $f(x) = sin^2 \pi x$

$f'(x) = 2\sin\pi x \cdot (\sin\pi x)' = 2\sin\pi x \cdot \cos\pi x \cdot (\pi x)' = 2\pi\sin\pi x\cos\pi x$. #

164. $x^2 + y^2 = 64$

$\Rightarrow 2x + 2y\frac{dy}{dx} = 0 \Rightarrow \frac{dy}{dx} = \frac{-x}{y}. \Rightarrow y' = \frac{-x}{y}$. #

165. $x^2 - y^2 = 25$

$\Rightarrow 2x - 2y\frac{dy}{dx} = 0 \Rightarrow \frac{dy}{dx} = \frac{x}{y} \Rightarrow y' = \frac{x}{y}$. #

166. $2x^3 + 3y^2 = 16$

$\Rightarrow 6x^2 + 6y\frac{dy}{dx} = 0 \Rightarrow \frac{dy}{dx} = \frac{-x^2}{y} \Rightarrow y' = \frac{-x^2}{y}$. #

167. $x^{1/2} + y^{1/2} = 16$

$\Rightarrow \frac{1}{2}x^{-\frac{1}{2}} + \frac{1}{2}y^{-\frac{1}{2}}\frac{dy}{dx} = 0 \Rightarrow \frac{dy}{dx} = \frac{-x^{-\frac{1}{2}}}{y^{-\frac{1}{2}}} \Rightarrow y' = -\sqrt{\frac{y}{x}}$. #

168. $x^2y + y^2x = -2$

$\Rightarrow 2xy + x^2\frac{dy}{dx} + 2y\frac{dy}{dx}x + y^2 = 0 \Rightarrow (2xy + y^2) + (x^2 + 2xy)\frac{dy}{dx} = 0 \Rightarrow \frac{dy}{dx} = \frac{-2xy - y^2}{x^2 + 2xy}$

$\Rightarrow y' = \frac{-y^2 - 2xy}{x^2 + 2xy}$. #

169. $x^3 - xy + y^2 = 7$

$\Rightarrow 3x^2 - y - x\frac{dy}{dx} + 2y\frac{dy}{dx} = 0 \Rightarrow (3x^2 - y) + (2y - x)\frac{dy}{dx} = 0 \Rightarrow \frac{dy}{dx} = \frac{-3x^2 + y}{-x + 2y} \Rightarrow y' = \frac{-3x^2 + y}{-x + 2y}$. #

170. $x^3y^3 - y = x$

$\Rightarrow 3x^2y^3 + x^3 \cdot 3y^2\frac{dy}{dx} - \frac{dy}{dx} = 1 \Rightarrow (3x^2y^3 - 1) + (3x^3y^2 - 1)\frac{dy}{dx} = 0 \Rightarrow y' = \frac{-3x^2y^3 + 1}{3x^3y^2 - 1}$. #

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

$\Rightarrow 2xy + x^2\frac{dy}{dx} + \frac{1}{2}x^{-\frac{1}{2}}y + x^{\frac{1}{2}}\frac{dy}{dx} = 0 \Rightarrow (2xy + \frac{1}{2}x^{-\frac{1}{2}}y) + (x^2 + x^{\frac{1}{2}})\frac{dy}{dx} = 0 \Rightarrow y' = \frac{-2xy - \frac{1}{2}x^{-\frac{1}{2}}y}{x^2 + x^{\frac{1}{2}}}$. #

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

172. $x^3 - 3x^2y + 2xy^2 = 12$

$\Rightarrow 3x^2 - 6xy - 3x^2\frac{dy}{dx} + 2y^2 + 4xy\frac{dy}{dx} = 0 \Rightarrow (3x^2 - 6xy + 2y^2) + (4xy - 3x^2)\frac{dy}{dx} = 0$

$\Rightarrow y' = \frac{-3x + 6xy - 2y^2}{4xy - 3x^2}$. #

173. $4\cos x \sin y = 1$

$\Rightarrow -4\sin x\sin y + 4\cos x\cos y \cdot \frac{dy}{dx} = 0 \Rightarrow \frac{dy}{dx} = \frac{\sin x\sin y}{\cos x\cos y}. \Rightarrow y' = \frac{\sin x\sin y}{\cos x\cos y}$. #

174. $\sin x + 2\cos 2y = 1$

$\Rightarrow \cos x - 2\sin 2y \cdot 2\frac{dy}{dx} = 0 \Rightarrow \frac{dy}{dx} = \frac{\cos x}{4\sin 2y} \Rightarrow y' = \frac{\cos x}{4\sin 2y}$. #

175. $(\sin\pi x + \cos\pi y)^2 = 2$

$\Rightarrow 2(\sin\pi x + \cos\pi y) \cdot (\cos\pi x \cdot \pi - \sin\pi y \cdot \pi \cdot \frac{dy}{dx}) = 0$

$\Rightarrow 2\pi\cos\pi x\sin\pi x - 2\pi\sin\pi x\sin\pi y\frac{dy}{dx} + 2\pi\cos\pi x\cos\pi y - 2\pi\cos\pi y\sin\pi y\frac{dy}{dx} = 0$

$\Rightarrow 2\pi\cos\pi x(\cos\pi y + \sin\pi x) - 2\pi\sin\pi y(\cos\pi y + \sin\pi x)\frac{dy}{dx} = 0$

$\Rightarrow y' = \frac{\cos\pi x(\cos\pi y + \sin\pi x)}{\sin\pi y(\cos\pi y + \sin\pi x)}. \Rightarrow y' = \frac{\cos\pi x}{\sin\pi y}$. #

176. $\cot y = x - y$

$\Rightarrow -\csc^2 y \cdot \frac{dy}{dx} = 1 - \frac{dy}{dx} \Rightarrow \frac{dy}{dx} = \frac{1}{1-\csc^2 y} \Rightarrow y' = \frac{1}{1-\csc^2 y}$. #

177. $\sin x = x(1 + \tan y)$

$\Rightarrow \cos x = (1+\tan y) + x(1+\sec^2 y) \cdot \frac{dy}{dx}$

$\Rightarrow \frac{dy}{dx} = \frac{\cos x - \tan y - 1}{x(1+\sec^2 y)} \Rightarrow y' = \frac{\cos x - \tan y - 1}{x(1+\sec^2 y)}$. #

178. $x \sin \frac{1}{y} = 1 \Rightarrow x \sin y^{-1} = 1$

$\Rightarrow (x)' \sin y^{-1} + x \cos y^{-1} \cdot (-y^{-2}) \cdot \frac{dy}{dx} = 0$

$\Rightarrow \sin \frac{1}{y} - \frac{x}{y^2} \cos \frac{1}{y} \cdot \frac{dy}{dx} = 0 \Rightarrow \frac{dy}{dx} = \frac{y^2 \sin y^{-1}}{x \cos y^{-1}} \Rightarrow y' = \frac{y^2 \sin y^{-1}}{x \cos y^{-1}}$. # $= \frac{y^2 \sin \frac{1}{y}}{x \cos \frac{1}{y}}$.

179. $y = \sin xy$

$y' = \cos(xy) \cdot ((x)' \cdot y + x \cdot \frac{dy}{dx}) = \cos(xy)(y + x\frac{dy}{dx}) = y\cos(xy) + x\cos(xy)\, y'$

$\Rightarrow y' = \frac{y\cos(xy)}{1 - x\cos(xy)}$. #

180. $f(x) = (5x^2 + 8)(x^2 - 4x - 6)$

$f'(x) = (5x^2+8)'(x^2-4x-6) + (5x^2+8)(x^2-4x-6)' = 10x(x^2-4x-6) + (5x^2+8)(2x-4)$

$= 20x^3 - 60x^2 - 44x - 32$. #

181. $g(x) = (2x^3 + 5x)(3x - 4)$

$g'(x) = (2x^3+5x)'(3x-4) + (2x^3+5x)(3x-4)' = (6x^2+5)(3x-4) + (2x^3+5x) \cdot 3$

$= 24x^3 - 24x^2 + 30x - 20$. #

182. $h(x) = \sqrt{x} \sin x = x^{\frac{1}{2}} \cdot \sin x$

$h'(x) = (x^{\frac{1}{2}})' \sin x + x^{\frac{1}{2}} \cdot (\sin x)' = \frac{1}{2} x^{-\frac{1}{2}} \sin x + x^{\frac{1}{2}} \cos x$. # $= \frac{\sin x}{2\sqrt{x}} + \sqrt{x}\cos x$.

183. $f(t) = 2t^5 \cos t$

$f'(t) = (2t^5)' \cdot \cos t + 2t^5 \cdot (\cos t)' = 10t^4 \cos t - 2t^5 \sin t = t^4(10\cos t - 2t\sin t)$. #

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

$f'(x) = \frac{(x^2-1)\cdot(x^2+x-1)' - (x^2-1)'(x^2+x-1)}{(x^2-1)^2} = \frac{(x^2-1)(2x+1) - 2x(x^2+x-1)}{(x^2-1)^2} = \frac{-x^2-1}{(x^2-1)^2}$. #

185. $f(x) = \frac{2x+7}{x^2+4}$

$f'(x) = \frac{(x^2+4)\cdot(2x+7)' - (x^2+4)'(2x+7)}{(x^2+4)^2} = \frac{2(x^2+4) - 2x(2x+7)}{(x^2+4)^2} = \frac{-2x^2-14x+8}{(x^2+4)^2} = \frac{-2(x^2+7x-4)}{(x^2+4)^2}$. #

186. $y = \frac{x^4}{\cos x}$

$y' = \frac{\cos x \cdot (x^4)' - (\cos x)' \cdot x^4}{\cos^2 x} = \frac{4x^3 \cos x + x^4 \sin x}{\cos^2 x} = \frac{x^3(4\cos x + x\sin x)}{\cos^2 x}$. #

187. $y = \frac{\sin x}{x^4}$

$$y' = \frac{x^4 \cdot (\sin x)' - (x^4)' \cdot \sin x}{(x^4)^2} = \frac{x^4 \cos x - 4x^3 \sin x}{x^8} = \frac{x^3(x\cos x - 4\sin x)}{x^8} = \frac{x\cos x - 4\sin x}{x^5}. \#$$

188. $y = 3x^2 \sec x$

$$y' = (3x^2)' \sec x + 3x^2 \cdot (\sec x)' = 6x \sec x + 3x^2 \sec x \tan x = 3x \sec x (2 + x\tan x). \#$$

189. $y = 2x - x^2 \tan x$

$$y' = (2x)' - (x^2)' \tan x + x^2 \cdot (\tan x)' = 2 - 2x\tan x + x^2 \sec^2 x. \#$$

190. $y = x\cos x - \sin x$

$$y' = (x)' \cos x + x \cdot (\cos x)' - (\sin x)' = \cos x - x\sin x - \cos x = -x\sin x. \#$$

191. $g(x) = 3x \sin x + x^2 \cos x$

$$g'(x) = (3x)' \cdot \sin x + 3x \cdot (\sin x)' + (x^2)' \cdot \cos x + x^2 \cdot (\cos x)' = 3\sin x + 3x\cos x + 2x\cos x - x^2 \sin x$$

$$= (-x^2+3)\sin x + 5x\cos x. \#$$

192. $y = (7x+3)^4$

$$y' = 4(7x+3)^3 \cdot (7x+3)' = 28(7x+3)^3. \#$$

193. $y = (x^2-6)^3$

$$y' = 3(x^2-6)^2 \cdot (x^2-6)' = 6x(x^2-6)^2. \#$$

194. $y = \frac{1}{x^2+4}$

$$y' = \frac{(x^2+4)\cdot(1)' - (x^2+4)' \cdot 1}{(x^2+4)^2} = \frac{-2x}{(x^2+4)^2}. \#$$

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

$$f'(x) = \frac{(5x+1)^2 \cdot (1)' - [(5x+1)^2]' \cdot 1}{[(5x+1)^2]^2} = \frac{-2(5x+1)\cdot(5x+1)'}{(5x+1)^4} = \frac{-10(5x+1)}{(5x+1)^4} = \frac{-10}{(5x+1)^3}. \#$$

196. $y = 5\cos(9x+1)$

$$y' = -5\sin(9x+1) \cdot (9x+1)' = -45\sin(9x+1). \#$$

197. $y = 1 - \cos 2x + 2\cos^2 x$

$$y' = \sin 2x \cdot (2x)' + 4\cos x \cdot (\cos x)' = 2\sin 2x - 4\cos x \sin x. \#$$

198. $y = \frac{x}{2} - \frac{\sin 2}{4} = \frac{1}{2}x - \frac{\sin 2}{4}$

$$y' = \frac{1}{2}. \#$$

199. $y = \frac{sec^7 x}{7} - \frac{sec^5 x}{5}$

$y' = \frac{7\cdot(\sec^7 x)' - (7)'\cdot \sec^7 x}{7^2} - \frac{5\cdot(\sec^5 x)' - (5)'\cdot \sec^5 x}{5^2} = \frac{49\sec^6 x\cdot \sec x\tan x}{49} - \frac{25\sec^4 x\cdot \sec x\tan x}{25}$

$= \sec^7 x\tan x - \sec^5 x\tan x$

$= \sec^5 x\tan x(\sec^2 x - 1).$ #

200. $y = x(6x+1)^5$

$y' = (6x+1)^5 + x\cdot 5(6x+1)^4\cdot 6 = (6x+1)^5 + 30x(6x+1)^4$

$= (6x+1)^4(36x+1).$ #

201. $f(s) = (s^2-1)^{5/2}(s^3+5)$

$f'(s) = \frac{5}{2}(s^2-1)^{\frac{3}{2}}\cdot 2s\cdot(s^3+5) + (s^2-1)^{\frac{5}{2}}\cdot 3s^2 = 5s(s^2-1)^{\frac{3}{2}}(s^3+5) + 3s^2(s^2-1)^{\frac{5}{2}}.$

$= s(s^2-1)^{\frac{3}{2}}(8s^3-3s+25).$ # $= s(8s^3-3s+25)\sqrt{(s^2-1)^3}$

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

$f'(x) = \frac{(x^2+1)^{\frac{1}{2}}\cdot(3x)' - [(x^2+1)^{\frac{1}{2}}]'\cdot 3x}{[(x^2+1)^{\frac{1}{2}}]^2} = \frac{3(x^2+1)^{\frac{1}{2}} - \frac{1}{2}(x^2+1)^{\frac{-1}{2}}\cdot 2x\cdot 3x}{x^2+1} = \frac{3(x^2+1)^{\frac{1}{2}} - 3x^2(x^2+1)^{\frac{-1}{2}}}{x^2+1}$

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

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

203. $h(x) = \left(\frac{x+5}{x^2+3}\right)^2$

$h'(x) = 2\left(\frac{x+5}{x^2+3}\right)\cdot\left(\frac{x+5}{x^2+3}\right)'$

$= \frac{2(x+5)}{x^2+3}\cdot\frac{(x^2+3)\cdot(x+5)' - (x^2+3)'\cdot(x+5)}{(x^2+3)^2}$

$= \frac{2(x+5)\cdot[(x^2+3) - 2x(x+5)]}{(x^2+3)^3} = \frac{-2(x+5)(x^2+10x-3)}{(x^2+3)^3}.$ #