DERIVADAS

1. $f(x) = 6 \to f'(x) = 0$

2. $f(x) = 0 \to f'(x) = 0$

3. $f(x) = \pi \to \ f'(x) = 0$

4. $f(x) = 3x^4 - 2x + 5 \to f'(x) = 12x^3 - 2$

5. $f(x) = e^x \to f'(x) = e^x$

6. $f(x) = ln\, x \to f'(x) = \frac{1}{x}$

7. $f(x) = sen\ (x) \to f'(x) = \cos x$

8. $f(x) = cos\ (x) \to f'(x) = \ -sen\ x$

9. $f(x) = tg\ (x) \to f'(x) = \frac{1}{cos^2 x}$

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

11. $f(x) = \sqrt{x} + \sqrt[3]{5x} \to f'(x) = \ \frac{1}{2\sqrt{x}} + \ \frac{5}{3\sqrt[3]{(5x)^2}}$

12. $y = \frac{x^2+1}{8} \to y' = \frac{2x}{8} \to y' = \frac{x}{4}$

13. $f(x) = 5x^4 + 2x \to f'(x) = 20x^3 + 2$

14. $f(x) = \frac{2}{3}x^6 \to f'(x) = \frac{12}{3}x^5 \to f'(x) = 4x^5$

15. $f(x) = 4x^{-5} + 6x^{3/2} + 3x + 3 \to$

$$f'(x) = -20x^{-6} + 6 \cdot \frac{3}{2}x^{1/2} + 3 \to f'(x) = -20x^{-6} + 9\sqrt{x} + 3$$

16. $f(x) = x^3 + x \to f'(x) = 3x^2 + 1$

17. $f(x) = \frac{1}{x\sqrt{x}} = \frac{1}{x \cdot x^{1/2}} = \frac{1}{x^{\frac{3}{2}}} = x^{-3/2} \to f'(x) = -\frac{3}{2}x^{-\frac{5}{2}} \to f'(x) = \frac{-3}{2\sqrt{x^5}}$

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

19. $f(x) = x^{10} \rightarrow f'(x) = 10x^9$
20. $y = x \cdot (x-1) \rightarrow f'(x) = 1 \cdot (x-1) + x \cdot 1 \rightarrow f'(x) = x - 1 + x \rightarrow f'(x) = 2x - 1$

21. $y = (x-1) \cdot (x+1) \rightarrow$
22. $f'(x) = 1 \cdot (x+1) + (x-1) \cdot 1 \rightarrow f'(x) = x + 1 + x - 1 \rightarrow f'(x) = 2x$
23. $y = (x+1) \cdot (x^2 - x + 3) \rightarrow$

$$f'(x) = 1 \cdot (x^2 - x + 3) + (x+1) \cdot (2x-1) \rightarrow f'(x) = x^2 - x + 3 + 2x^2 - x + 2x - 1 \rightarrow f'(x) = 3x^2 + 2$$

24. $y = x \cdot (x^2 + 2x) \rightarrow$
25. $y' = 1 \cdot (x^2 + 2x) + x\,(2x + 2) \rightarrow y' = x^2 + 2x + 2x^2 + 2x \rightarrow y' = 3x^2 + 4x$
26. $y = \frac{x+1}{x^2}$

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

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

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

28. $y = \left(3x^2 + \frac{2}{5}x\right) \cdot (5x + 7)$

$$y' = \left(6x + \frac{2}{5}\right) \cdot (5x + 7) + \left(3x^2 + \frac{2}{5}x\right) \cdot 5 \rightarrow y' = 30x^2 + 42x + 2x + \frac{14}{5} + 15x^2 + 2x$$
$$y' = 45x^2 + 46x + \frac{14}{5}$$

29. $y = \frac{x^2}{3x+5}$

$$y' = \frac{2x \cdot (3x+5) - x^2 \cdot (3)}{(3x+5)^2} \rightarrow y' = \frac{6x^2 + 10x - 3x^2}{(3x+5)^2} \rightarrow y' = \frac{3x^2 + 10x}{(3x+5)^2} \rightarrow$$
$$y' = \frac{x(3x+10)}{(3x+5)^2}$$

30. $y = x \cdot (x+2) \cdot (x^2 + 1)$

Antes de hacer la derivada, es mejor que te facilites los cálculos: $y = (x^2 + 2x) \cdot (x^2 + 1)$

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

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

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

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

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

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

$$f'(x) = \frac{3e^x + (3x+1) \cdot e^x}{(e^x)^2} \rightarrow f'(x) = \frac{e^x[3 + 3x + 1]}{(e^x)^2} \rightarrow f'(x) = \frac{3x + 4}{e^x}$$

34. $f(x) = \sqrt[3]{x} \cdot sen\, x \rightarrow$

$$f'(x) = \frac{1}{3\sqrt[3]{x^2}} \cdot sen\, x + \sqrt[3]{x} \cos x$$

35. $f(x) = \frac{x^2+2}{2x+1} \rightarrow$

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

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

36. $f(x) = x^2 \cdot sen\, x \rightarrow$

$$f'(x) = (2x)\cdot sen\, x + x^2 \cdot \cos x \rightarrow f'(x) = x \cdot (2\, sen\, x + x\cos x)$$

37. $y = e^x \cdot (x^2 - 3x) \rightarrow$

$$y' = e^x \cdot (x^2-3x) + e^x(2x-3) \rightarrow y' = e^x[x^2 - x - 3]$$

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

$$y' = \frac{2x\cdot(x^2+3) - (x^2-3)\cdot 2x}{(x^2+3)^2} \rightarrow y' = \frac{2x^3+6x-2x^3+6x}{(x^2+3)^2} \rightarrow y' = \frac{12x}{(x^2+3)^2}$$

39. $y = \frac{1}{sen\, x^2}$

$$y' = \frac{-1\cdot\cos x^2 \cdot 2x}{(sen\, x^2)^2} \rightarrow y' = \frac{-2x\ \cdot \cos x^2}{(sen\, x^2)^2}$$

40. $y = \frac{1-\sqrt{x}}{1+\sqrt{x}}$

$$y' = \frac{-\frac{1}{2\sqrt{x}}\cdot(1+\sqrt{x}) - (1-\sqrt{x})\cdot\frac{1}{2\sqrt{x}}}{\left(1+\sqrt{x}\right)^2} \rightarrow y' = \frac{-\frac{1}{2\sqrt{x}} - \frac{1}{2} - \frac{1}{2\sqrt{x}} + \frac{1}{2}}{\left(1+\sqrt{x}\right)^2} \rightarrow$$

$$y' = \frac{\frac{-2}{2\sqrt{x}}}{\left(1+\sqrt{x}\right)^2} \rightarrow y' = \frac{-\frac{1}{\sqrt{x}}}{\left(1+\sqrt{x}\right)^2} \rightarrow y' = -\frac{1}{\sqrt{x}\cdot\left(1+\sqrt{x}\right)^2}$$

41. $y = x \cdot e^x$

$$y' = 1\cdot e^x + x\cdot e^x \rightarrow y' = e^x[1+x]$$

42. $y = x \cdot 2^x$

$$y' = 1\cdot 2^x + x\cdot 2^x \cdot \ln 2 \rightarrow y' = 2^x[1 + x\ln 2]$$

43. $y = (x^2+1)\cdot \log_2 x$

$$y' = 2x\cdot\log_2 x + (x^2+1)\cdot\frac{1}{x\cdot\ln 2}$$

44. $y = \frac{\ln x}{x}$

$$y' = \frac{\frac{1}{x}\cdot x - \ln x}{x^2} \rightarrow y' = \frac{1-\ln x}{x^2}$$

45. $y = (3x^2+x)^4$

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

46. $y = ln\,(3x^4 - 2x)$

$$y' = \frac{(3x^4-2x)'}{3x^4-2x} \rightarrow y' = \frac{12x^3-2}{3x^4-2x}$$

47. $y = sen\left(\frac{x+1}{2x-3}\right)$

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

$$y' = \cos\left(\frac{x+1}{2x-3}\right) \cdot \left(\frac{-5}{(2x-3)^2}\right)$$

48. $y = cos\left(\frac{3x}{x^2+2}\right)$

$$y' = -sen\left(\frac{3x}{x^2+2}\right) \cdot \left(\frac{3x}{x^2+2}\right)' \to -sen\left(\frac{3x}{x^2+2}\right) \cdot \left(\frac{3 \cdot (x^2+2) - 3x \cdot 2x}{(x^2+2)^2}\right) \to$$

$$-sen\left(\frac{3x}{x^2+2}\right) \cdot \left(\frac{-3x^2+6}{(x^2+2)^2}\right)$$

49. $y = e^{\frac{x^2+1}{x-1}}$

$$y' = e^{\frac{x^2+1}{x-1}} \cdot \left(\frac{x^2+1}{x-1}\right)' \to y' = e^{\frac{x^2+1}{x-1}} \cdot \left(\frac{2x \cdot (x-1) - (x^2+1) \cdot 1}{(x-1)^2}\right) \to$$

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

50. $y = \sqrt{2x-3x^4}$

$$y' = \frac{1}{2\sqrt{2x-3x^4}} \cdot (2x-3x^4)' \to y' = \frac{1}{2\sqrt{2x-3x^4}} \cdot (2-12x^3)$$

51. $f(x) = cos^{\,2}(x^4-2)$

Antes de empezar quiero que esta idea te quede clara

$$f(x) = cos^2\,(x^4-2) = (\cos(x^4-2))^2$$

$$f'(x) = 2 \cdot (\cos(x^4-2)) \cdot (\cos(x^4-2))'$$

$$f'(x) = 2 \cdot (\cos(x^4-2)) \cdot \left(-sen\,(x^4-2)\right) \cdot (x^4-2)'$$

$$f'(x) = 2 \cdot (\cos(x^4-2)) \cdot \left(-sen\,(x^4-2)\right) \cdot 4x^3$$

52. $y = \sqrt{\frac{3x-1}{4x+2}}$

$$y' = \frac{\left(\frac{3x-1}{4x+2}\right)'}{2\sqrt{\frac{3x-1}{4x+2}}} \to y' = \frac{\frac{3(4x+2)-(3x-1)\cdot 4}{(4x+2)^2}}{2\sqrt{\frac{3x-1}{4x+2}}} \to y' = \frac{\frac{10}{(4x+2)^2}}{2\sqrt{\frac{3x-1}{4x+2}}} \to$$

$$y' = \frac{10}{2(4x+2)^2\sqrt{\frac{3x-1}{4x+2}}} \to y' = \frac{5}{(4x+2)^2\sqrt{\frac{3x-1}{4x+2}}}$$

53. $y = ln\,(ln\,(2x-1))$

$$y' = \frac{(\ln(2x-1))'}{\ln(2x-1)} \to y' = \frac{\frac{(2x-1)'}{\ln(2x-1)}}{\ln(2x-1)} \to y' = \frac{\frac{2}{\ln(2x-1)}}{\ln(2x-1)} \to$$

$$y' = \frac{2}{ln\,(2x-1) \cdot ln\,(2x-1)} \to y' = \frac{2}{(n\,(2x-1))^2}$$

54. $y = sen^2\,x^2$

$$y' = 2 \cdot (sen\,x^2) \cdot (\cos x^2) \cdot 2x \to y' = 4 \cdot (sen\,x^2) \cdot (\cos x^2)$$

55. $y = arctg\, \frac{x}{3}$

$$y' = \frac{\frac{1}{3}}{1 + \tan\left(\frac{x}{3}\right)^2}$$

56. $y = 3x^5 - 4x^3 - 4$

$$y' = 15x^4 - 12x^2$$

57. $y = x + \ln x$

$$y' = 1 + \frac{1}{x} \rightarrow minimo\ común\ multiplo \rightarrow y' = \frac{x+1}{x}$$

58. $y = 2x^2 - e^2$

$$y' = 4x$$

59. $y = x \cdot e^x$

$$y' = 1 \cdot e^x + x \cdot e^x \rightarrow factor\ común \rightarrow y' = e^x\,(1 + x)$$

60. $y = x \cdot \sqrt{x}$

$$Antes\ de\ derivar\ y = x \cdot x^{\frac{1}{2}} \rightarrow y = x^{3/2}$$

$$y' = \frac{3}{2}x^{3/2-1} \rightarrow y' = \frac{3}{2}x^{\frac{1}{2}} \rightarrow y' = \frac{3}{2}\sqrt{x}$$

61. $y = \frac{x+2}{x-2}$

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

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

$$y' = \frac{\frac{1}{x} \cdot e^x - \ln x \cdot e^x}{(e^x)^2} \rightarrow y' = \frac{e^x\left[\frac{1}{x} - \ln x\right]}{e^{2x}} \rightarrow y' = \frac{\left[\frac{1}{x} - \ln x\right]}{e^x}$$

63. $y = e^{2x} + \frac{2}{x}$

$$y' = 2e^{2x} + \frac{-2}{x^2}$$

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

$$y' = 3(2x+1)^2 \cdot 2 \rightarrow y' = 6 \cdot (2x+1)^2$$

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

$$y' = 2^{2z} \cdot 2 \cdot \ln 2$$

66. $y = e^{2-3x}$

$$y' = e^{2-3x} \cdot (-3)$$

67. $y = (2x-1) \cdot e^{2x-1}$

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

68. $y = \sqrt{2x-1}$

$$y' = \frac{2}{2\sqrt{2x-1}} \rightarrow y' = \frac{1}{\sqrt{2x-1}}$$

69. $y = \ln(x^2 - 2)$

$$y' = \frac{2x}{x^2 - 2}$$

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

$$y' = 2x \cdot (2x-1)^3 + x^2 \cdot 3(2x-1)^2 \cdot 2 \rightarrow y' = (2x-1)^2[2x(2x-1) + 6x^2] \rightarrow$$
$$y' = (2x-1)^2[10x^2 - 2x]$$

71. $y = \frac{e^x}{x+1}$

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

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

$$y' = \frac{2x \cdot \sqrt{x-1} - (x^2-1) \cdot \frac{1}{2\sqrt{x-1}}}{\left(\sqrt{x-1}\right)^2} \rightarrow y' = \frac{2x \cdot \sqrt{x-1} - (x^2-1) \cdot \frac{1}{2\sqrt{x-1}}}{x-1}$$

$\rightarrow$ minimo común múltiplo en numerador $\rightarrow$

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

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

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

74. $y = \frac{e^{5x}}{x^3-1}$

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

75. $f(x) = 4x \cdot \ln(3x+1)$

$$f'(x) = 4\ln(3x+1) + 4x \cdot \frac{3}{3x+1} \rightarrow f'(x) = 4\ln(3x+1) + \frac{12x}{3x+1}$$

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

$$f'(x) = 2x(x^3+2x) + (x^2-1)(3x^2+2) \rightarrow f'(x)$$
$$= 2x^4 + 4x^2 + 3x^4 + 2x^2 - 3x^2 - 2 \rightarrow$$
$$f'(x) = 5x^4 + 3x^2 - 2$$

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

$$f'(x) = \frac{2e^{2x+1} \cdot (x-1)^2 - e^{2x+1} \cdot 2 \cdot (x-1)}{[(x-1)^2]^2} \rightarrow f'(x) = \frac{2(x-1)e^{2x+1}[x-2]}{(x-1)^4} \rightarrow$$

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

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

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

79. $f(x)=\frac{3x-1}{x}\cdot(5x-x^2)^2$

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

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

$$f'(x)=\frac{(5x-x^2)^2+x(3x-1)(10-4x)(5x-x^2)}{x^2}\rightarrow$$

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

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

$$f'(x)=\frac{(5x-x^2)[(5x-x^2)+30x^2-12x^3-10x+4x^2]}{x^2}\rightarrow$$

$$f'(x)=\frac{(5x-x^2)[33x^2-12x^3-5x]}{x^2}\rightarrow f'(x)=\frac{x(5x-x^2)[33x-12x^2-5]}{x^2}\rightarrow$$

$$f'(x)=\frac{(5x-x^2)[33x-12x^2-5]}{x}$$

80. $f(x)=(x^2-1)\cdot\ln x$

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

81. $f(x)=2^{5x}$

$$f'(x)=5\cdot 2^{5x}\cdot\ln 2$$

82. $(x^3-6x)(x^2+1)^3$

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

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

83. $f(x)=(x+1)\cdot e^{2x+1}$

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

84. $f(x)=\frac{\ln x}{x^2}$

$$f'(x)=\frac{\frac{1}{x}\cdot x^2-(2x)\cdot\ln x}{x^4}\rightarrow f'(x)=\frac{x-2x\cdot\ln x}{x^4}\rightarrow f'(x)=\frac{x[1-2\ln x]}{x^4}\rightarrow f'(x)$$
$$=\frac{1-2\ln x}{x^3}$$

85. $f(x) = (1 - x^3)\cos x$

$$f'(x) = -3x^2 \cdot \cos x + (1 - x^3) \cdot (-sen\ x) \rightarrow f'(x) = -3x^2 \cdot \cos x - (1 - x^3) \cdot (sen\ x)$$

86. $f(x) = sin^4\left(\frac{x}{3} + \frac{3}{x}\right) \rightarrow f(x) = \left[\sin\left(\frac{x}{3} + \frac{3}{x}\right)\right]^4$

$$f'(x) = 4 \cdot \left[\sin\left(\frac{x}{3} + \frac{3}{x}\right)\right]^3 \cdot \left(\sin\left(\frac{x}{3} + \frac{3}{x}\right)\right)'$$

$$f'(x) = 4 \cdot \left[\sin\left(\frac{x}{3} + \frac{3}{x}\right)\right]^3 \cdot \cos\left(\frac{x}{3} + \frac{3}{x}\right) \cdot \left(\frac{x}{3} + \frac{3}{x}\right)'$$

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

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

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

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

88. $f(x) = x^5 \cdot e^{ln^3 x} - \ln x^3$

$$f'(x) = 5x^4 \cdot e^{ln^3 x} + x^5 \cdot e^{ln^3 x} \cdot 3(\ln x)^2 \cdot \frac{1}{x} - \frac{3x^2}{x^3}$$

$$f'(x) = 5x^4 \cdot e^{ln^3 x} + x^5 \cdot e^{ln^3 x} \cdot 3(\ln x)^2 \cdot \frac{1}{x} - \frac{3}{x}$$

89. $f(x) = \frac{\ln 3x}{e^{2x}}$

$$f'(x) = \frac{\frac{3}{3x} \cdot e^{2x} - \ln 3x \cdot (2e^{2x})}{[e^{2x}]^2} \rightarrow f'(x) = \frac{e^{2x}\left[\frac{1}{x} - 2\ln 3x\right]}{[e^{2x}]^2} \rightarrow f'(x) = \frac{\left[\frac{1}{x} - 2\ln 3x\right]}{e^{2x}}$$

90. $f(x) = \log_5\left[\cos\left(\sqrt{x + \sqrt{x}}\right)\right]$

$$f'(x) = \frac{\left(\cos\left(\sqrt{x+\sqrt{x}}\right)\right)'}{\cos\left(\sqrt{x+\sqrt{x}}\right) \cdot \ln 5} \rightarrow f'(x) = \frac{-sen\ \left(\sqrt{x+\sqrt{x}}\right) \cdot \left(\sqrt{x+\sqrt{x}}\right)'}{\cos\left(\sqrt{x+\sqrt{x}}\right) \cdot \ln 5} \rightarrow$$

$$f'(x) = \frac{-\ sen\ \left(\sqrt{x+\sqrt{x}}\right) \cdot \frac{1 + \frac{1}{2\sqrt{x}}}{\sqrt{x+\sqrt{x}}}}{\cos\left(\sqrt{x+\sqrt{x}}\right) \cdot \ln 5} \rightarrow \ f'(x) = \frac{-sen\ \left(\sqrt{x+\sqrt{x}}\right) \cdot \frac{\frac{2\sqrt{x}+1}{2\sqrt{x}}}{\sqrt{x+\sqrt{x}}}}{\cos\left(\sqrt{x+\sqrt{x}}\right) \cdot \ln 5} \rightarrow$$

$$f'(x) = \frac{-sen\ \left(\sqrt{x+\sqrt{x}}\right) \cdot \frac{2\sqrt{x}+1}{(2\sqrt{x}) \cdot \left(\sqrt{x+\sqrt{x}}\right)}}{\cos\left(\sqrt{x+\sqrt{x}}\right) \cdot \ln 5}$$

91. $y = \ln\sqrt{\frac{x^3}{x^2-1}}$

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

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

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

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

$$y' = 2x(3x^3+5x)^3 + (x^2-1)\cdot 3\cdot (3x^3+5x)^2\cdot(9x^2+5)$$

$$y' = (3x^3+5x)^2[6x^4+10x^2+27x^2+15] \rightarrow y' = (3x^3+5x)^2[6x^4+37x^2+15]$$

93. $y = \sqrt[5]{\sin x}$

$$antes\ de\ derivar \rightarrow y = (\sin x)^{1/5}$$

$$y' = \frac{1}{5}(sen\ x)^{\frac{1}{5}-1}\cdot \cos x \rightarrow y' = \frac{\cos x}{5\sqrt[5]{(sen\ x)^4}}$$

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

$$y' = 3^{(\cos x)^2}\cdot 2\cdot \cos x\,(-sen\ x)\cdot \ln 3$$

95. $y = \sin[(\ln x)^2]$

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

96. $y = e^{1/x}\cdot \ln(sen\ x)^2$

$$y' = e^{1/x}\cdot\frac{-1}{x^2}\cdot \ln(sen\ x)^2 + e^{1/x}\cdot\frac{2\cdot sen\ x\ \cdot \cos x}{(sen\ x)^2}$$

$$y' = e^{1/x}\left[\frac{-\ln(sen\ x)^2}{x^2} + \frac{2\cos x}{sen\ x}\right]$$

97. $y = \frac{x^4}{tan^3 x}$ $\longrightarrow$

$$\boxed{\begin{array}{c} y = \frac{u}{v} \rightarrow y' = \frac{u'\cdot v - u\cdot v'}{v^2} \\ v = \tan f(x) \rightarrow v' = \frac{f'(x)}{cos^2 f(x)} \end{array}}$$

$$y' = \frac{4x^3\cdot tan^3 x - x^4\cdot 3\,tan^2 x\ \cdot\frac{1}{cos^2 x}}{(tan^3 x)^2} \rightarrow$$

$$y' = \frac{tan^2 x\left[4x^3\cdot \tan x\ - x^4\cdot 3\cdot\frac{1}{cos^2 x}\right]}{(tan^3 x)^2} \rightarrow$$

$$y' = \frac{\left[4x^3 \cdot \tan x \; - x^4 \cdot 3 \cdot \frac{1}{cos^2 x}\right]}{tan^4 x}$$

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

$$y' = 2^{\cos x^2} \cdot \ln 2 \cdot (-sen\, x^2) \cdot 2x$$

99. $y = \left(\frac{x}{1-x^2}\right)^5$

$$y' = 5\left(\frac{x}{1-x^2}\right)^4 \cdot \frac{1 \cdot (1-x^2) - x \cdot (-2x)}{(1-x^2)^2} \rightarrow y' = 5\left(\frac{x}{1-x^2}\right)^4 \cdot \frac{1+x^2}{(1-x^2)^2}$$

100. $y = \ln(\tan x)$

$$y' = \frac{\frac{1}{cos^2 x}}{\tan x} \rightarrow y' = \frac{\frac{1}{cos^2 x}}{\frac{sen\, x}{\cos x}} \rightarrow y' = \frac{\cos x}{cos^2 x\; sen\, x} \rightarrow y' = \frac{1}{\cos x\; sen\, x}$$

101. $y = \sqrt{\cos x}$

$$y' = \frac{-sen\, x}{2\sqrt{\cos x}}$$

102. $y = \cos \sqrt{x} \longrightarrow$ $\boxed{y = \cos u \rightarrow y' = -u' \cdot sen\, u}$

$$y' = -sen\, \sqrt{x} \cdot \frac{1}{2\sqrt{x}}$$

103. $y = \log_2 x^2 \longrightarrow$ $\boxed{y = \log_a u \rightarrow y' = \frac{u'}{u \cdot \ln a}}$

$$y' = \frac{2x}{x^2 \cdot \ln 2} \rightarrow y' = \frac{2}{x \cdot \ln 2}$$

104. $y = log_2^2\, x = (\log_2 x)^2$

$$y' = 2 \cdot \log_2 x \cdot \frac{1}{x \cdot \ln 2}$$

105. $y = \frac{e^{4x+1}}{x^4+1}$

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

106. $y = \frac{x^2-3}{\sqrt{x^3}}$

$$y' = \frac{2x\sqrt{x^3} - (x^2-3) \cdot \frac{3x^2}{2\sqrt{x^3}}}{\left(\sqrt{x^3}\right)^2} \rightarrow y' = \frac{2x\sqrt{x^3} - (x^2-3) \cdot \frac{3x^2}{2\sqrt{x^3}}}{x^3} \rightarrow$$

$$y' = \frac{\frac{2x \cdot 2 \cdot \sqrt{x^3}\sqrt{x^3} - 3x^4 + 9x^2}{2\sqrt{x^3}}}{x^3} \rightarrow y' = \frac{4x^4 - 3x^4 + 9x^2}{2x^3\sqrt{x^3}} \rightarrow y' = \frac{x^4 + 9x^2}{2x^3\sqrt{x^3}}$$

$$y' = \frac{x^2(x^2+9)}{2x^4\sqrt{x}} \rightarrow y' = \frac{x^2+9}{2x^2\sqrt{x}}$$

107. $y = \frac{x}{(1-x)^3}$

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

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

108. $y = sen\,(\cos x)$

$$y' = \cos(\cos x) \cdot (-sen\,x)$$

109. $y = \cos(sen\,x)$

$$y' = -sen\,(sen\,x) \cdot \cos x$$

110. $y = \arctan x^2$ $\longrightarrow$ $\boxed{y = \arctan u \rightarrow y' = \frac{u'}{1+u^2}}$

$$y' = \frac{2x}{1+(x^2)^2}$$

$\boxed{y = \operatorname{arcsen} u \rightarrow y' = \frac{u'}{\sqrt{1-u^2}}}$

111. $y = arcsen\,(2x-1)^2$ $\longrightarrow$

$$y' = \frac{2(2x-1)2}{\sqrt{1-(2x-1)^4}} \rightarrow y' = \frac{4(2x-1)}{\sqrt{1-(2x-1)^4}}$$

112. $y = arctan\,^2\sqrt{x}$

$$antes\ de\ derivar \rightarrow y = \left(\arctan\sqrt{x}\right)^2$$

$$y' = 2 \cdot \left(\arctan\sqrt{x}\right)^1 \cdot \frac{\frac{1}{2\sqrt{x}}}{1+\left(\sqrt{x}\right)^2} \rightarrow y' = 2 \cdot \left(\arctan\sqrt{x}\right)^1 \cdot \frac{\frac{1}{2\sqrt{x}}}{1+x} \rightarrow$$

$$y' = 2 \cdot \left(\arctan\sqrt{x}\right)^1 \cdot \frac{1}{2\sqrt{x} \cdot (1+x)}$$

113. $y = \arccos e^{2x}$ $\longrightarrow$ $\boxed{y = \arccos u \rightarrow y' = -\frac{u'}{\sqrt{1-u^2}}}$

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

114. $y = arcsen\,\left(\frac{1}{x}\right)$

$$y' = \frac{\frac{-1}{x^2}}{\sqrt{1-\left(\frac{1}{x}\right)^2}}$$

115. $y = \ln\left(sen\,\left(\sqrt{3x^5}\right)\right)$

$$y' = \frac{\cos\sqrt{3x^5} \cdot \frac{15x^4}{2\sqrt{3x^5}}}{sen\,\left(\sqrt{3x^5}\right)}$$

116. $y = sen\,(ln^2 x)$

$$y' = \cos(ln^2\,x) \cdot 2 \cdot \ln x \cdot \frac{1}{x}$$

117. $y = arccos^3 \, e^{-x}$

$$antes \; de \; derivar \rightarrow y = (\arccos e^{-x})^3$$

$$y' = 3 \cdot (\arccos e^{-x})^2 \cdot \frac{-e^{-x}}{\sqrt{1-(e^{-x})^2}}$$

118. $y = x^4 - 5x^2 + 2 \rightarrow y' = 4x^3 - 10x$

119. $y = 2x^3 + 3x^2 - 6x + 5 \rightarrow y' = 6x^2 + 6x - 6$

120. $y = (x+1)(x^2 - x + 3) = x^3 - x^2 + 3x + x^2 - x + 3 = x^3 + 2x + 3 \rightarrow y' = 3x^2 + 2$

121. $y = x(x-1)^2 = x(x^2 - 2x + 1) = x^3 - 2x^2 + x \rightarrow y' = 3x^2 - 4x + 1$

122. $y = 5\log_2 x \rightarrow y' = 5 \cdot \frac{1}{x \cdot \ln 2} \rightarrow y' = \frac{5}{x \cdot \ln 2}$

123. $y = 3\log_5 5x \rightarrow y' = 3 \cdot \frac{5}{5x \cdot \ln 5} \rightarrow y' = \frac{3}{x \cdot \ln 5}$

124. $y = 2\ln x + sen\, x - 4\cos x \rightarrow y' = \frac{2}{x} + \cos x - 4 \cdot (-sen\, x) = \frac{2}{x} + \cos x + 4sen\, x$

125. $y = x(1+x)^5 \rightarrow y' = 1 \cdot (1+x)^5 + x \cdot 5 \cdot (1+x)^4 = (1+x)^4[1 + x + 5x] =$

$$= (1+x)^4[1+6x]$$

126. $y = x\, sen\, x \rightarrow y' = 1 \cdot sen\, x + x\cos x = sen\, x + x\cos x$

127. $y = x^3 \cdot \ln x \rightarrow y' = 3x^2 \cdot \ln x + x^3 \cdot \frac{1}{x} = 3x^2 \cdot \ln x + x^2 = x^2[3\ln x + 1]$

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

129. $y = \frac{\ln x}{x} \rightarrow y' = \frac{\frac{1}{x} \cdot x - \ln x}{x^2} = \frac{1 - \ln x}{x^2}$

130. $y = \frac{sen\, x}{1 - \cos x} \rightarrow y' = \frac{\cos x \cdot (1 - \cos x) - sen\, x \cdot sen\, x}{(1-\cos x)^2} = \frac{\cos x - cos^2\, x - sen^{\,2} x}{(1-\cos x)^2} = \frac{\cos x - [cos^2\, x + sen^{\,2} x]}{(1-\cos x)^2}$

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

131. $y = x^3 \cdot \cos x \rightarrow y' = 3x^2 \cdot \cos x + x^3 \cdot (-sen\, x) = x^2[3\cos x - x\, sen\, x]$

132. $y = x\tan x \rightarrow y' = \tan x + x \cdot \frac{1}{cos^2\, x}$

133. $y = (1 + x^2)^7 \rightarrow y' = 7(1+x^2)^6 \cdot 2x = 14x \cdot (1+x^2)^6$

134. $y = \ln x \; \cdot sen\, x \rightarrow y' = \frac{1}{x} \cdot sen\, x + \ln x \; \cdot \cos x \rightarrow y' = \frac{sen\, x + x \cdot \ln x \cdot \cos x}{x}$

135. $y = \ln sen\, x \rightarrow y' = \frac{(sen\, x)'}{sen\, x} \rightarrow y' = \frac{\cos x}{sen\, x} \rightarrow y' = cotan\, x$

136. $y = sen \ln x \rightarrow y' = \frac{1}{x} \cdot \cos lnx$

137. $y = (x^2 - 3x + 1)sen\, x + x\cos x \rightarrow$

$$y' = (2x-3)sen\, x + (x^2 - 3x + 1)(\cos x) + 1 \cdot \cos x + x\,(-sen\, x) \rightarrow$$

$$y' = (2x-3)sen\, x + (x^2 - 3x + 1)(\cos x) + \cos x - x\,(sen\, x)$$

138. $y = \frac{x}{(1+x^2)^2} \rightarrow$

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

139. $y = \ln x^3 \rightarrow y' = \frac{3x^2}{x^3} \rightarrow y' = \frac{3}{x}$

140. $y = \ln x^2 + ln^2\, x \rightarrow y' = \frac{2x}{x^2} + 2\ln x \cdot \frac{1}{x} \rightarrow y' = \frac{2}{x} + 2\ln x \; \cdot \frac{1}{x} \rightarrow y' = \frac{2 + 2\ln x}{x}$

141. $y = e^{2x} \rightarrow y' = 2e^{2x}$

142. $y = 3^x \rightarrow y' = 3^x \cdot \ln 3$

143. $y = xe^x \rightarrow y' = 1 \cdot e^x + xe^x \rightarrow y' = e^x[1 + x]$

144. $y = e^x + e^{-x} \rightarrow y' = e^x + e^{-x}(-1) \rightarrow y' = e^x - e^{-x}$

145. $y = x4^x \rightarrow y' = 1 \cdot 4^x + x4^x \cdot \ln 4 \rightarrow y' = 4^x[1 + x\ln 4]$

146. $y = (x^2 - 3x + 3)e^x \rightarrow y' = (2x - 3)e^x + (x^2 - 3x + 3)e^x \rightarrow y' = e^x[x^2 - x]$

147. $y = (sen\, x + \cos x)e^x \rightarrow y' = (\cos x - sen\, x)e^x + (sen\, x + \cos x)e^x \rightarrow y' = e^x[2\cos x]$

148. $y = \sqrt{x^2+1} \rightarrow y' = \frac{2x}{2\sqrt{x^2+1}} \rightarrow y' = \frac{x}{\sqrt{x^2+1}}$

149. $y = \sqrt[4]{e^3+3} \rightarrow y' = 0$ (todo lo que sea un número su derivada es cero)

150. $y = \frac{1}{\sqrt{x}} \rightarrow$

$$y = \frac{1}{x^{\frac{1}{2}}} \rightarrow y = x^{-\frac{1}{2}} \rightarrow Ahora\ derivar \rightarrow y' = -\frac{1}{2}x^{-\frac{1}{2}-1} \rightarrow y' = -\frac{1}{2}x^{-\frac{3}{2}} \rightarrow y' = \frac{-1}{2\sqrt{x^3}}$$

151. $y = x^5 \cdot (1 + x^2)^3 \rightarrow$

$$y' = 5x^4(1+x^2)^3 + x^5 \cdot 3 \cdot (1+x^2)^2 \cdot 2x \rightarrow y' = x^4(1+x^2)^2[5 + 5x^2 + 6x^2] \rightarrow$$

$$y' = x^4(1+x^2)^2[5 + 11x^2]$$

152. $y = \frac{x^3}{\ln x}$

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

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

$$y' = \frac{1 + \frac{2x}{2\sqrt{x^2+1}}}{x + \sqrt{x^2+1}} \rightarrow y' = \frac{\sqrt{x^2+1} + x}{\sqrt{x^2+1}\left[x + \sqrt{x^2+1}\right]}$$

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

$$y' = \frac{\left(\frac{(x-2)^5}{(x+1)^3}\right)'}{\frac{(x-2)^5}{(x+1)^3}} \rightarrow y' = \frac{\frac{5(x-2)^4(x+1)^3 - (x-2)^5 \cdot 3(x+1)^2}{(x+1)^6}}{\frac{(x-2)^5}{(x+1)^3}} \rightarrow$$

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

$$y' = \frac{5(x+1) - (x-2) \cdot 3}{(x+1)(x-2)} \rightarrow y' = \frac{5x + 5 - 3x + 6}{(x+1)(x-2)} \rightarrow y' = \frac{2x + 11}{(x+1)(x-2)}$$

155. $y = \ln\frac{\sqrt{x^2+1}-x}{\sqrt{x^2+1}+x} \rightarrow$

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