11. $\frac{d}{dx}[\log_a u] = \frac{u'}{(\ln a)u}$

12. $\frac{d}{dx}[a^u] = (\ln a)a^u u'$

$y' = \frac{-4\ln 5}{5^{-4x}}$

Find the Derivative of the below functions: (Consider Expanding Log Expressions before Deriving if applicable)

39. $y = 5^{-4x}$

$y' = \ln 5 \cdot 5^{-4x} \cdot (-4)$ | $y' = -4\ln 5 \cdot 5^{-4x}$

40. $y = 6^{3x-4}$

$y' = \ln 6 \cdot 6^{3x-4} \cdot 3$ | $y' = 3\ln 6 \cdot 6^{3x-4}$

41. $f(x) = x\,9^x$

$f'(x) = \overset{f'}{1} \cdot \overset{g}{9^x} + \overset{f}{x} \cdot \overset{g'}{\ln 9 \cdot 9^x}$

42. $y = x(6^{-2x})$

$y' = \overset{f'}{1}\ \overset{g}{6^{-2x}} + \overset{f}{x} \cdot \overset{g'}{\ln 6 \cdot 6^{-2x} \cdot (-2)}$

49. $h(t) = \log_5(4-t)^2$

$h(t) = 2\log_5(4-t)$

$h'(t) = 2 \cdot \frac{1}{\ln 5} \cdot \frac{-1}{4-t} = \frac{-2}{\ln 5(4-t)}$

48. $y = \log_3(x^2 - 3x)$

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

51. $y = \log_5 \sqrt{x^2-1}$

$y = \log_5(x^2-1)^{1/2}$ | $y' = \frac{1}{2} \cdot \frac{1}{\ln 5} \cdot \frac{2x}{x^2-1}$

$y = \frac{1}{2}\log_5(x^2-1)$ | $y' = \frac{x}{(\ln 5)(x^2-1)}$

50. $g(t) = \log_2(t^2+7)^3$

$g(t) = 3\log_2(t^2+7)$

$g'(t) = 3 \cdot \frac{1}{\ln 2} \cdot \frac{2t}{t^2+7}$ | $g'(t) = \frac{6t}{(\ln 2)(t^2+7)}$

53. $f(x) = \log_2 \frac{x^2}{x-1}$

$f(x) = \log_2(x^2) - \log_2(x-1)$

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

52. $f(x) = \log_2 \sqrt[3]{2x+1}$

$f(x) = \log_2(2x+1)^{1/3}$ | $f'(x) = \frac{1}{3} \cdot \frac{1}{\ln 2} \cdot \frac{2}{2x+1}$

$f(x) = \frac{1}{3}\log_2(2x+1)$ | $f'(x) = \frac{2}{3\ln 2(2x+1)}$

55. $h(x) = \log_3 \frac{x\sqrt{x-1}}{2}$

$h(x) = \log_3 x + \log_3(x-1)^{1/2} - \log_3 2$

$h(x) = \log_3(x) + \frac{1}{2}\log_3(x-1) - \log_3 2$

$h'(x) = \frac{1}{\ln 3} \cdot \frac{1}{x} + \frac{1}{2} \cdot \frac{1}{\ln 3} \cdot \frac{1}{x-1} - 0$

56. $g(x) = \log_5 \frac{4}{x^2\sqrt{1-x}}$

$g(x) = \log_5 4 - \log_5 x^2 - \log_5(1-x)^{1/2}$

$g(x) = \log_5 4 - \log_5 x^2 - \frac{1}{2}\log_5(1-x)$

$g'(x) = 0 - \frac{1}{\ln 5} \cdot \frac{2x}{x^2} - \frac{1}{2} \cdot \frac{1}{\ln 5} \cdot \frac{-1}{1-x}$