L3 (Appendix p.571) The Derivative of the Natural Logarithmic Function

If y = ln(x), then y' = $\frac{1}{x}$, $x > 0$

If y = ln[g(x)], then y ' = $\frac{1}{g(x)} g'(x), \quad g(x) > 0$

Ex1: Find y'.

a) $y=\ln(5x)$

$$y'=\frac{1}{5x}5$$
$$=\frac{1}{x}$$

b) $y=\ln(7x^2)$

$$y'=\frac{14x}{7x^2}$$
$$=\frac{2}{x}$$

c) $y=\ln\sqrt{5x}$

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

Inefficient Way

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

d) $y=3^x\ln(x^3)$

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

Assigned Work:

p.575 #3-13 (omit 5c and 9bc)
for 7(use graphing technology)