Mathematics 3208 Logarithmic Differentiation

For each function below:

- Use Laws of Logs to re-write each expression as a combination of logs.
- Determine the derivative

1. $y = \ln(x+1)^2(4x-1)^3$

2. $y = \ln\sqrt{x^2+x^3}$

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

Advantages of logarithmic differentiation

- to simplify a complicated derivative involving products, quotients and powers using the rules of logarithms.
- to deal with functions that have variables in the base as well as in the exponent.

Differentiate the following.

a. $y = \left(\dfrac{x+2}{2x+1} \right)^3$

b. $y = x^x$

c. $y = \dfrac{(2x+1)^3 \left(x^3 + x\right)^4}{(x^2+1)^2}$

d. $y = \dfrac{x^{\frac{2}{3}} \sqrt{x^2+2}}{\left(x^3(6x+1)\right)^3}$

e. $y = x^{\cos x}$

f. $\dfrac{d}{dx}(\cos x)^{\tan x} = (\cos x)^{\tan x} \left[\sec^2 x \ln(\cos x) - \tan^2 x \right]$