2B Higher Derivatives for Maclaurin Series

1. Given that:

$$y = ln(1 - x)$$

Find the value of:

$$\left(\frac{d^3y}{dx^3}\right)_{\frac{1}{2}}$$

2. Given that:

$$f(x) = e^{x^2}$$

a) Show that:

$$f'(x) = 2xf(x)$$

b) By differentiating the result twice more with respect to x, find f''(x) and f'''(x)

c) Deduce the values of f(0), f'(0), f''(0) and f'''(0)