Problem Set #1

2/5/2001

17.1

(#3) $y = (3x^2+2)^x$

since variable is in base and in exponent => take ln

$$\ln y = \ln (3x^2+2)^x$$

$$\ln y = x \ln (3x^2+2)$$

$$\frac{d}{dx} \ln y = \frac{d}{dx} [x \ln (3x^2+2)]$$ differentiate

chain rule → $$\frac{1}{y} \frac{dy}{dx} = x \cdot \frac{6x}{3x^2+2} + \ln (3x^2+2)$$ ← product rule

$$\frac{dy}{dx} = y \left[x \cdot \frac{6x}{3x^2+2} + \ln (3x^2+2) \right]$$

$$\frac{dy}{dx} = (3x^2+2)^x \left[\frac{6x^2}{3x^2+2} + \ln (3x^2+2) \right]$$

17.2

(#2) Find $f'(x)$

a) $f(x) = 3 \cdot 2^x + 2 \cdot x^3 + 3 \cdot x^{2x+3}$, where $x > 0$

$$f'(x) = \frac{d}{dx} \left[3 \cdot 2^x + 2 \cdot x^3 + 3 \cdot x^{2x+3} \right]$$

$$= \frac{d}{dx} \left[y_1 + y_2 + y_3 \right]$$

where $y_1 = 3 \cdot 2^x$

$y_2 = 2 \cdot x^3$

$y_3 = 3 \cdot x^{2x+3}$

$$= \frac{dy_1}{dx} + \frac{dy_2}{dx} + \frac{dy_3}{dx}$$ (separate functions)