Cont'd:

Derivative Notation:

$f'(x)$ "f prime of x"

$\frac{dy}{dx}$ "deriv. of y w/ respect to x"

$y'$ "y prime"

$\frac{d}{dx}[f(x)]$ "deriv. of f(x) w/ respect to x"

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

Differentiation = process of finding the derivative of a function

Ex 1) Find deriv. of $f(x) = \frac{1}{x^2}$

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = \lim_{h\to 0} \frac{\frac{1}{(x+h)^2} - \frac{1}{x^2}}{h} \cdot \frac{x^2(x+h)^2}{x^2(x+h)^2}$$

$$= \lim_{h\to 0} \frac{x^2-(x+h)^2}{h\cdot x^2(x+h)^2} = \lim_{h\to 0} \frac{x^2-(x^2+2xh+h^2)}{h\cdot x^2(x+h)^2}$$

$$= \lim_{h\to 0} \frac{x^2-x^2-2xh-h^2}{h\cdot x^2(x+h)^2} = \lim_{h\to 0} \frac{h(-2x-h)}{h\cdot x^2(x+h)^2}$$

$$= \frac{-2x}{x^2\cdot x^2} = \frac{-2x}{x^4} = \boxed{\frac{-2}{x^3}}$$