1/16/15 Derivatives Cont.

$f(x) = x^3$

$f(x+h) = (x+h)^3$

$$f'(x) = \lim_{h\to 0} \frac{(x+h)^3 - x^3}{h}$$

$$= (x+h)(x+h)(x+h)$$

$$(x^2+2xh+h^2)(x+h)$$

$$= \frac{x^3 + 3x^2h + 3xh^2 + h^3 - x^3}{h}$$

PIM $$= \frac{h(3x^2 + 3xh + h^2)}{h}$$

$$= 3x^2 + 0 + 0 = \boxed{3x^2}$$

$f(x) = x^4$

$f(x+h) = (x+h)^4$

$$f'(x) = \lim_{h\to 0} \frac{(x+h)^4 - x^4}{h}$$

$$= \frac{1x^4 + 4x^3h + 6x^2h^2 + 4xh^3 + 1h^4 - 1x^4}{h}$$

$$= \frac{h(4x^3 + 6x^2h + 4xh^2)}{h}$$

PIM $$= 4x^3 + 0 + 0 = \boxed{4x^3}$$

$f(x) = c$ $\quad f'(x) = 0$

$f(x) = x^2$ $\quad f'(x) = 2x^{2-1=1}$

$f(x) = 5x^5 - 4x^3$ $\quad f'(x) = 25x^4 - 12x^2$