

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

Unit 5 - Functions and Limits

5.1 Evaluating Functions and Average Rate of Change

① $F(x) = 2x^2 + 3x - 1$

a) $f(0) = \boxed{-1}$

b) $f(-2x) = 2(-2x)^2 + 3(-2x) - 1$
 $= \boxed{8x^2 - 6x - 1}$

c) $f(x+4) = 2(x+4)^2 + 3(x+4) - 1$
 $= 2(x^2 + 8x + 16) + 3(x+4) - 1$
 $= 2x^2 + 16x + 32 + 3x + 12 - 1$
 $= \boxed{2x^2 + 19x + 43}$

d) $\frac{f(x+h) - f(x)}{h} = \frac{2(x+h)^2 + 3(x+h) - 1 - (2x^2 + 3x - 1)}{h}$
 $= \frac{2(x^2 + 2xh + h^2) + 3(x+h) - 1 - (2x^2 + 3x - 1)}{h}$
 $= \frac{2x^2 + 4xh + 2h^2 + 3x + 3h - 1 - 2x^2 - 3x + 1}{h}$
 $= \frac{4xh + 2h^2 + 3h}{h} = \boxed{4x + 2h + 3}$

$$\textcircled{2} f(x) = x^3 - 4$$

$$a) f(0) = \boxed{-4}$$

$$b) f(-2x) = (-2x)^3 - 4 \\ = \boxed{-8x^3 - 4}$$

$$c) f(x+4) = (x+4)^3 - 4 \\ = x^3 + 3x^2(4) + 3x(4)^2 + 4^3 - 4 \\ = x^3 + 12x^2 + 48x + 64 - 4 \\ = \boxed{x^3 + 12x^2 + 48x + 60}$$

$$d) \frac{f(x+h) - f(x)}{h}$$

$$= \frac{(x+h)^3 - 4 - (x^3 - 4)}{h}$$

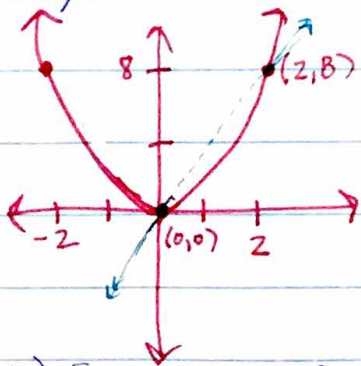
$$= \frac{x^3 + 3x^2h + 3xh^2 + h^3 - 4 - x^3 + 4}{h}$$

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

$$\text{Average Rate of Change} = \text{slope} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

Ex $\textcircled{3}$ Find the average rate of change of $f(x) = 2x^2$

a) from 0 to 2.



* Avg. rate of change = slope of secant line through the two points.

$$\frac{8-0}{2-0} = \frac{8}{2} = \boxed{4}$$

b) from 5 to 8 $\left(\begin{matrix} (5, 50) \\ (8, 128) \end{matrix} \right)$ $\frac{128-50}{8-5} = \frac{78}{3} = \boxed{26}$

$$\textcircled{4} \quad h(x) = 2x^2 - 2x$$

Write the equation of secant line containing
(2, h(2)) and (4, h(4))

$$(2, 4)$$

$$(4, 24)$$

$$m = \frac{24 - 4}{4 - 2} = \frac{20}{2} = 10$$

$$y = mx + b$$

$$4 = 10(2) + b$$

$$4 = 20 + b$$

$$-16 = b$$

$$\boxed{y = 10x - 16}$$