How are your algebra skills?

For today, you are going to simplify each of the following polynomials. Follow the example below.

Example

For the function $f(x) = 2x^2 - 3x$, find $\dfrac{f(x+h) - f(x)}{h}$.

1. First substitute the function into the formula above.

$$\frac{[2(x+h)^2 - 3(x+h)] - [2x^2 - 3x]}{h}$$

2. Now expand in the first bracket

$$\frac{[2(x^2 + 2xh + h^2) - 3(x+h)] - [2x^2 - 3x]}{h}$$

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

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

3. Collect like terms in the numerator

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

4. Common Factor the numerator

$$\frac{h(4x + 2h - 3)}{h}$$

5. Now cancel

$$4x + 2h - 3$$

1. For each of the following functions below, find $\dfrac{f(x+h)-f(x)}{h}$.

a) $f(x)=3x^2-4x$

b) $f(x)=-3x^2+x-2$

c) $f(x)=-3x-2$

d) $f(x)=2x^3-1$

e) $f(x)=5x-4$

f) $f(x)=x^3-2x^2-3x$

g) $f(x)=x^4$

h) $f(x)=-2x+5$

i) $f(x)=\dfrac{x+6}{2}$

j) $f(x)=\dfrac{2}{x^2}$

1. For each of the following functions below, find $\dfrac{f(x+h)-f(x)}{h}$.

a) $f(x)=3x^2-4x$ $6x-4+3h$

b) $f(x)=-3x^2+x-2$ $-6x+1-3h$

c) $f(x)=-3x-2$ -3

d) $f(x)=2x^3-1$ $6x^2+6xh+2h^2$

e) $f(x)=5x-4$ 5

f) $f(x)=x^3-2x^2-3x$ $3x^2-4x-3+3xh+h^2-2h$

g) $f(x)=x^4$

$4x^3+6x^2h+4xh^2+h^3$

h) $f(x)=-2x+5$ -2

i) $f(x)=\dfrac{x+6}{2}$ $\dfrac{1}{2}$

j) $f(x)=\dfrac{2}{x^2}$ $\dfrac{-2\,\cancel{(2x+1)}}{\cancel{x^2}\,\cancel{(x+h)^2}}$

$2\left[\dfrac{-2x-h}{x^2(x+h)^2}\right]$

a) $\dfrac{3(x+h)^2-4(x+h)-(3x^2-4x)}{h}$

$=\dfrac{3(x^2+2xh+h^2)-\cancel{4x}-4h-3x^2+\cancel{4x}}{h}$

$=\dfrac{\cancel{3x^2}+6xh+3h^2-4h-\cancel{3x^2}}{h}$

$=\dfrac{\cancel{h}(6x+3h-4)}{\cancel{h}}$