This worksheet is homework to be included in your homework notebook.   [Odd-Numbered Answers on Back]

1. Given $f(x) = 4x^2$, find the following and simplify.

(a). $f(x+h)$

$= 4(x+h)^2$

$= 4(x^2+2xh+h^2)$

$= \boxed{4x^2+8xh+4h^2}$

(b). $\boxed{f(x+h)} - f(x)$

$= 4x^2+8xh+4h^2 - 4x^2$

(c). $\dfrac{f(x+h)-f(x)}{h}$

$= \dfrac{8xh+4h^2}{h}$ Factor GCF out!

$= \dfrac{4h(2x+h)}{h}$

$= \boxed{4(2x+h) \text{ or } 8x+4h}$

(d). If you let $h=0$, what do you get from your answer to part (c)?

$\boxed{8x}$

2. Given $f(x) = 2x^2 - x$, find the following and simplify.

(a). $f(x+h)$

$= 2(x+h)^2 - (x+h)$

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

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

(b). $\boxed{f(x+h)} - f(x)$

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

$= 2x^2+4xh+2h^2-x-h-2x^2+x$

$= \boxed{4xh+2h^2-h}$

(c). $\dfrac{f(x+h)-f(x)}{h}$

$= \dfrac{4xh+2h^2-h}{h}$

$= \dfrac{h(4x+2h-1)}{h}$

$= \boxed{4x+2h-1}$

(d). If you let $h=0$, what do you get from your answer to part (c)?

$\boxed{4x-1}$

3. Given $f(x) = 9 - \dfrac{1}{2}x^2$, find the following and simplify.

(a). $f(x+h)$

$= 9 - \tfrac{1}{2}(x+h)^2$

$= 9 - \tfrac{1}{2}(x^2+2xh+h^2)$

$= 9 - \tfrac{1}{2}x^2 - xh - \tfrac{1}{2}h^2$

(b). $\boxed{f(x+h)} - f(x)$

$= 9 - \tfrac{1}{2}x^2 - xh - \tfrac{1}{2}h^2 - 9 + \tfrac{1}{2}x^2$

$= -xh - \tfrac{1}{2}h^2$

(c). $\dfrac{f(x+h)-f(x)}{h}$

$= \dfrac{-xh-\tfrac{1}{2}h^2}{h}$

$= \dfrac{h(-x-\tfrac{1}{2}h)}{h}$

$= \boxed{-x-\tfrac{1}{2}h}$

(d). If you let $h=0$, what do you get from your answer to part (c)?

$\boxed{-x}$

4. Given $f(x) = 1 - x^2$, find and simplify $\dfrac{f(x+h) - f(x)}{h}$.

(a) $f(x+h)$

$1 - (x+h)^2$

$1 - (x^2 + 2xh + h^2)$

$\boxed{1 - x^2 - 2xh - h^2}$

(b) $f(x+h) - f(x)$

$= \cancel{1} - x^2 - 2xh - h^2 - \cancel{1} + x^2$

$= \boxed{-2xh - h^2}$

(c) $\dfrac{f(x+h) - f(x)}{h}$

$\dfrac{-2xh - h^2}{h}$

$\dfrac{\cancel{h}(-2x - h)}{\cancel{h}}$

If you let $h = 0$, what does your answer become?

$\boxed{-2x}$

5. Given $C(x) = 2x^2 - 4x + 3$, find and simplify $\dfrac{C(x+h) - C(x)}{h}$.

(a) $C(x+h)$

$2(x+h)^2 - 4(x+h) + 3$

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

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

(b) $C(x+h) - C(x)$

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

$\boxed{4xh + 2h^2 - 4h}$

(c) $\dfrac{C(x+h) - C(x)}{h}$

$\dfrac{4xh + 2h^2 - 4h}{h}$

$\dfrac{\cancel{h}(4x + 2h - 4)}{\cancel{h}}$

$\boxed{4x + 2h - 4}$

If you let $h = 0$, what does your answer become?

$\boxed{4x - 4}$

6. Given $p(q) = q^2 + 2q - 5$, find and simplify $\dfrac{p(q+h) - p(q)}{h}$.

(a) $p(q+h)$

$(q+h)^2 + 2(q+h) - 5$

$q^2 + 2qh + h^2 + 2q + 2h - 5$

(b) $p(q+h) - p(q)$

$q^2 + 2qh + h^2 + 2q + 2h - 5 - q^2 - 2q + 5$

$2qh + h^2 + 2h$

$= \dfrac{p(q+h) - p(q)}{h}$

$= \dfrac{2qh + h^2 + 2h}{h}$

$= \dfrac{\cancel{h}(2q + h + 2)}{\cancel{h}}$

$= \boxed{2q + h + 2}$

If you let $h = 0$, what does your answer become?

$\boxed{2q + 2}$