

PC 1-9 The Difference Quotient

Students will be able to evaluate and simplify the difference quotient given a function.

Let $f(x) = 5x - 10$

Evaluate $\frac{f(x+h)-f(x)}{h}$, $h \neq 0$

In other words, evaluate the difference quotient of the function f .

$$\frac{f(x+h)-f(x)}{h} = \frac{5(x+h)-10-(5x-10)}{h}$$

$$= \frac{\cancel{5x} + 5h - \cancel{10} - \cancel{5x} + \cancel{10}}{h}$$

$$= \frac{5h}{h} = 5$$

Let $g(x) = -4x^2 + 9x$

Evaluate $\frac{g(x+h)-g(x)}{h}$, $h \neq 0$

In other words, evaluate the difference quotient of the function g .

$$\frac{g(x+h)-g(x)}{h} = \frac{-4(x+h)^2 + 9(x+h) - (-4x^2 + 9x)}{h}$$

$$= \frac{-4(x^2 + 2xh + h^2) + 9x + 9h + 4x^2 - 9x}{h}$$

$$= \frac{\cancel{-4x^2} - 8xh - 4h^2 + \cancel{9x} + 9h + \cancel{4x^2} - \cancel{9x}}{h}$$

$$= \frac{-8xh - 4h^2 + 9h}{h} = \frac{h(-8x - 4h + 9)}{h}$$

$$= -8x - 4h + 9$$