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$$f(x) = 4x + 3$$

$$g(x) = 2x - 9$$

$$(f+g)(x) = (4x+3) + (2x-9)$$

$$(f+g)(x) = 6x - 6$$

$$(f-g)(x) = (4x+3) - (2x-9)$$

$$(f-g)(x) = 2x + 12$$

~~$4x+3-2x+9$~~

$$(g-f)(x) = (2x-9) - (4x+3)$$

$$(g-f)(x) = 2x - 9 - 4x - 3$$

$$(g-f)(x) = -2x - 12$$

$$(fg)(x) = (4x+3)(2x-9)$$

$$(fg)(x) = 8x^2 - 36x + 6x - 27$$

$$(fg)(x) = 8x^2 - 30x - 27$$

$$\left(\frac{f}{g}\right)(x) = \frac{4x+3}{2x-9}$$

$$\left[\begin{array}{l} x=0 \\ \frac{3}{-9} \\ -\frac{1}{3} \\ \text{OK} \end{array} \right]$$

Domain Restriction

$$2x - 9 \neq 0$$

$$2x \neq \frac{9}{2}$$

$$x \neq \frac{9}{4}$$

$$\frac{3}{4} \quad \frac{13.1}{13.2}$$

$$\frac{1}{2}$$

$$\frac{12+1}{12+4}$$

$$\frac{1}{4}$$

$$\frac{6}{2} \Rightarrow 3$$

$$\frac{6}{0} \Rightarrow \text{Nothing}$$

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

$$g(x) = x^2 + 5x + 6$$

$$\left(\frac{f}{g}\right)(x) = \frac{x+3}{x^2+5x+6}$$

$$\left(\frac{f}{g}\right)(x) = \frac{\cancel{x+3}}{\cancel{x+3}(x+2)} \quad \begin{matrix} 6 \cdot 1 \\ 2 \cdot 3 \end{matrix}$$

$$\left(\frac{f}{g}\right)(x) = \frac{1}{x+2}$$

Domain

$$\left(\frac{f}{g}\right) = \frac{x+3}{(x+3)(x+2)}$$

$$x+3 \neq 0 \quad x+2 \neq 0$$

$$x \neq -3 \text{ or } x \neq -2$$

Composite Functions

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

$$g(x) = 2x + 5 \quad x + 3$$

$$(f \circ g)(x) = (2x + 5) + 3$$

$f \circ g$ of x

$$(f \circ g)(x) = 2x + 8$$

$$f(g(x)) = 2x + 8$$

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

$$g(x) = 2x + 5$$

$$(g \circ f)(x) = 2(x + 3) + 5 \quad 2x + 5$$

$$(g \circ f)(x) = 2x + 6 + 5$$

$$(g \circ f)(x) = 2x + 11$$

$$(g \circ f)(4) = 2(4) + 11$$

$$(g \circ f)(4) = 8 + 11$$

$$(g \circ f)(4) = 19$$

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

$$g(x) = 2x + 5$$

$$(g \circ f)(4) = 19$$

$$f(4) = 4 + 3$$

$$f(4) = 7$$

$$g(7) = 2(7) + 5$$

$$g(7) = 14 + 5$$

$$g(7) = 19$$

$$f(x) = x + 7$$

$$g(x) = x^2$$

$$x+7$$

$$(f \circ f)(x) = x + 7 + 7$$

$$(f \circ f)(x) = x + 14$$

$$(g \circ f)(x) = (x+7)^2 \quad x^2$$

$$(g \circ f)(x) = (x+7)(x+7)$$

$$(g \circ f)(x) = x^2 + 7x + 7x + 49$$

$$(g \circ f)(x) = x^2 + 14x + 49$$

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