Sum, Difference, Product, Quotient and Composition of Functions

Sum: $(f+g)(x) = f(x) + g(x)$

Difference: $(f-g)(x) = f(x) - g(x)$

Product: $(f \cdot g)(x) = f(x) \cdot g(x)$

Quotient: $\left(\dfrac{f}{g}\right)(x) = \dfrac{f(x)}{g(x)}, \quad g(x) \neq 0$

1. For $f(x) = x^2 + 2$ and $g(x) = x - 6$ find:

a) $(f+g)(x)$

b) $(f-g)(x)$

c) $(f \cdot g)(x)$

d) $\left(\dfrac{f}{g}\right)(x)$

e) $(f+g)(-4)$

f) $(f+g)(x-4)$

Composition of Functions

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

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

2. Find $(f \circ g)(x)$ and $(g \circ f)(x)$.

a) $f(x) = \sqrt[3]{x+2}, \quad g(x) = x^3 - 2$

b) $f(x) = \dfrac{1}{5}x - 2, \ g(x) = 5x + 2$

c) $f(x) = \sqrt{x+1}, \ g(x) = x^2 - 3$

d) $f(x) = \sqrt{x^2 - 1}, \ g(x) = \dfrac{x^2}{x^2 + 2}$

3. Find two functions f and g such that $(f \circ g)(x) = h(x)$.

a) $h(x) = \sqrt[3]{2-x}$

b) $h(x) = \dfrac{3}{(2x-1)^2}$

c) $h(x) = (x+1)^3 + 2(x+1)^2$