Section 8.3 The Algebra of Functions

Finding the domain of a function:

The domain is the set of numbers that x can be. We state domain in interval notation.

ex: $f(x) = 3x + 2$

Domain is all real numbers

$D = (-\infty, \infty)$

ex: $g(x) = \frac{3x+2}{x+1}$

When there's a fraction set bottom = 0. Then the domain is everything except what makes bottom = 0.

$x + 1 = 0$

$-1 \quad -1$

$x = -1$

$D = (-\infty, -1) \cup (-1, \infty)$

↑ union of 2 sets

You try: Domain of

a) $f(x) = \frac{1}{2}x + 3$

$D = (-\infty, \infty)$

b) $g(x) = \frac{7x+4}{x+5}$

$D = (-\infty, -5) \cup (-5, \infty)$

Operations on Functions

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

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

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

Quotient: $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$

ex: $f(x) = x^2 - 3$ $\quad g(x) = 4x + 5$

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

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

$= x^2 - 3 + 4x + 5$

$= x^2 + 4x + 2$

b) $(f+g)(3)$

$= 3^2 + 4 \cdot 3 + 2$

$= 9 + 12 + 2$

$= 23$

Your turn: $f(x) = 3x^2 + 4x - 1$ $\quad g(x) = 2x + 7$

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

b) $(f+g)(4)$

$= 3x^2 + 4x - 1 + 2x + 7$

$= 3x^2 + 6x + 6$

$= 3 \cdot 4^2 + 6 \cdot 4 + 6$

$= 3 \cdot 16 + 24 + 6$

$= 48 + 24 + 6$

$= 78$

ex: $f(x) = x^2 + x \quad g(x) = x - 5$

a) $(f+g)(4) = \underbrace{(4^2+4)}_{f(4)} + \underbrace{(4-5)}_{g(4)}$

$= 20 + (-1)$

$= 19$

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

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

$= (x^2 + x) - (x - 5)$

$= x^2 + x - x + 5$

$= x^2 + 5$

$(f-g)(-3) = (-3)^2 + 5$

$= 14$

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

$= (x^2 + x)(x - 5)$

$= x^3 - 5x^2 + x^2 - 5x$

$= x^3 - 4x^2 - 5x$

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

$= \frac{x(x+1)}{x-5}$

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1-5 odd, 11-17 odd, 29-57odd, 61, 64