2.8a Goal: Students will be able to find the sum, difference, product, and quotient of functions and determine the domain of the result.

Sums and Differences of Functions

For functions f and g with domains P and Q respectively, the sum and difference of f and g are defined by:

	Domain of result
$(f+g)(x) = f(x) + g(x)$	$P \cap Q$
$(f-g)(x) = f(x) - g(x)$	$P \cap Q$

Given $f(x) = 2x^2 - 18$ and $g(x) = -3x - 7$

$x \in (-\infty, \infty)$ $x \in (-\infty, \infty)$

a) Determine the domain for h(x) = (f-g)(x)

$x \in (-\infty, \infty)$

b) find h(5) using the definition

$(f-g)(x) = h(x)$ $h(5) = f(5) - g(5) = 32 - -22 = 54$

c) find a new function rule for h

$h(x) = f(x) - g(x) = 2x^2 - 18 - (-3x - 7) = 2x^2 + 3x - 11$

d) find h(5) using the rule found in (c)

$h(5) = 2(5)^2 + 3(5) - 11 = 50 + 15 - 11 = 54$

2.8a Goal: Students will be able to find the sum, difference, product, and quotient of functions and determine the domain of the result.

Products and Quotients of Functions

For functions f and g with domains P and Q, respectively, the product and quotient of f and g are defined by:

	Domain of result
$(f \cdot g)(x) = f(x) \cdot g(x)$	$P \cap Q$
$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$	$P \cap Q$, for all $g(x) \neq 0$

Given $p(x) = \sqrt{6-x}$ and $q(x) = \sqrt{x+2}$

$6 - x \geq 0$

$6 \geq x$

$x \leq 6$

$x + 2 \geq 0$

$x \geq -2$

a) Determine the domain for $r(x) = (p \cdot q)(x)$

$x \in [-2, 6]$

b) find a new function rule for r

$r(x) = \sqrt{(6-x)} \cdot \sqrt{(x+2)} = \sqrt{-x^2+4x+12}$

c) find r(-3) and r(2) if possible

$r(-3)$ undefined $\quad r(2) = \sqrt{-2^2+4(2)+12} = \sqrt{16} = 4$

2.8a Goal: Students will be able to find the sum, difference, product, and quotient of functions and determine the domain of the result.

Products and Quotients of Functions

For functions f and g with domains P and Q, respectively, the product and quotient of f and g are defined by:

	Domain of result
$(f \cdot g)(x) = f(x) \cdot g(x)$	$P \cap Q$
$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$	$P \cap Q$, for all $g(x) \neq 0$

Given $f(x) = x^3 - 5x^2 + 2x - 10$ and $g(x) = x - 5$

a) Determine the domain for $h(x) = \left(\frac{f}{g}\right)(x)$

$x - 5 \neq 0 \quad x \neq 5$

$x \in (-\infty, 5) \cup (5, \infty)$

b) find a new function rule for h

$$h(x) = \frac{f(x)}{g(x)} = \frac{x^3 - 5x^2 + 2x - 10}{(x - 5)} = \frac{x^2(x - 5) + 2(x - 5)}{(x - 5)}$$

$$= \frac{(x - 5)(x^2 + 2)}{(x - 5)}$$

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

2.8a Goal: Students will be able to find the sum, difference, product, and quotient of functions and determine the domain of the result.

Products and Quotients of Functions

For functions f and g with domains P and Q, respectively, the product and quotient of f and g are defined by:

	Domain of result
$(f \cdot g)(x) = f(x) \cdot g(x)$	$P \cap Q$
$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$	$P \cap Q$, for all $g(x) \neq 0$

Given $p(x) = x+2$ and $q(x) = \sqrt{x+3}$ $\quad x+3 \geq 0$, $x \geq -3$

a) Determine the domain for $r(x) = \left(\frac{p}{q}\right)(x)$ $\quad \frac{x+2}{\sqrt{x+3}}$ $\quad x > -3$ $\quad x \in (-3, \infty)$

b) find a new function rule for r

$r(x) = \frac{x+2}{\sqrt{x+3}}$

c) use it to evaluate r(6) and r(-6) if possible

$r(6) = \frac{6+2}{\sqrt{6+3}} = \frac{8}{3}$ $\quad r(-6) =$ und

2.8a Goal: Students will be able to find the sum, difference, product, and quotient of functions and determine the domain of the result.

Determine the sum, difference, product, and quotient of f and g, then determine the domain in each case.

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

$x \in (-\infty, \infty)$

$(f+g)(x) = x - 5 + 2x - 3 = 3x - 8$

$(f-g)(x) = x - 5 - (2x - 3) = -1x - 2$

$(f \cdot g)(x) = (x - 5)(2x - 3) = 2x^2 - 13x + 15$

$\left(\frac{f}{g}\right)(x) = \frac{x-5}{2x-3}, \quad x \in (-\infty, \frac{3}{2}) \cup (\frac{3}{2}, \infty)$

$2x - 3 \neq 0$

$x \neq 3/2$

2.8a Goal: Students will be able to find the sum, difference, product, and quotient of functions and determine the domain of the result.

Determine the sum, difference, product, and quotient of f and g, then determine the domain in each case.

$x \in (-\infty, -5) \cup (-5, 3) \cup (3, \infty)$

$$f(x) = \frac{4}{x-3} \qquad g(x) = \frac{1}{x+5}$$

$(f+g)(x)$ $\frac{4(x+5)}{(x-3)(x+5)} + \frac{1}{(x+5)}\frac{(x-3)}{(x-3)} = \frac{4x+20+x-3}{(x-3)(x+5)} = \frac{5x+17}{(x-3)(x+5)}$

$(f-g)(x)$ $\frac{4}{(x-3)} - \frac{1}{(x+5)} = \frac{4x+20-(x-3)}{(x-3)(x+5)} = \frac{3x+23}{(x-3)(x+5)}$

$(f \cdot g)(x)$ $\frac{4}{x-3} \cdot \frac{1}{x+5} = \frac{4}{(x-3)(x+5)}$

$\left(\frac{f}{g}\right)(x)$ $\frac{\frac{4}{x-3}}{\frac{1}{x+5}} = \frac{4}{(x-3)} \cdot \frac{(x+5)}{1} = \frac{4x+20}{x-3}$

2.8a Goal: Students will be able to find the sum, difference, product, and quotient of functions and determine the domain of the result.

2.8a

p. 265

7-29 odd

35, 45, 81, 83

Profit = Revenue - Cost