

MAC1105 College Algebra  
3.5 Practice Problems

1. Find the following if  $f(x) = \sqrt{x}$  and  $g(x) = 2x^2 - 1$ .

a.  $(f+g)(1)$

$$\begin{aligned} &= f(1) + g(1) \\ &= \sqrt{1} + 2(1)^2 - 1 \\ &= 1 + 2 - 1 \\ &= 2 \end{aligned}$$

b.  $(f-g)(4)$

$$\begin{aligned} &= f(4) - g(4) \\ &= \sqrt{4} - (2(4)^2 - 1) \\ &= 2 - (32 - 1) \\ &= 2 - 31 \\ &= -29 \end{aligned}$$

c.  $(fg)(9)$

$$\begin{aligned} &= f(9)g(9) \\ &= \sqrt{9}(2(9)^2 - 1) \\ &= 3(2(81) - 1) \\ &= 3(162 - 1) \\ &= 3(161) \\ &= 483 \end{aligned}$$

d.  $\left(\frac{f}{g}\right)(16)$

$$\begin{aligned} &= \frac{f(16)}{g(16)} \\ &= \frac{\sqrt{16}}{2(16)^2 - 1} \\ &= \frac{4}{2(256) - 1} = \frac{4}{512 - 1} = \frac{4}{511} \end{aligned}$$

2. Find  $f+g$ ,  $f-g$ ,  $fg$ , and  $\frac{f}{g}$  if  $f(x) = x^2 - 25$  and  $g(x) = x^2 + 2x - 15$ .

Determine the domain for each function.

$$\begin{aligned} (f+g)(x) &= f(x) + g(x) = x^2 - 25 + x^2 + 2x - 15 \\ &= 2x^2 + 2x - 40 \end{aligned}$$

$$D_{f+g} = D_f \cap D_g = (-\infty, \infty) \cap (-\infty, \infty) = (-\infty, \infty)$$

$D_f: (-\infty, \infty)$   
Since  $f$  is a polynomial

$D_g: (-\infty, \infty)$   
since  $g$  is a polynomial

$$\begin{aligned} (f-g)(x) &= f(x) - g(x) = (x^2 - 25) - (x^2 + 2x - 15) \\ &= x^2 - 25 - x^2 - 2x + 15 \\ &= -2x - 10 \end{aligned}$$

$$\begin{aligned} D_{f-g} &= D_f \cap D_g \\ &= (-\infty, \infty) \cap (-\infty, \infty) \\ &= (-\infty, \infty) \end{aligned}$$

$$\begin{aligned} (fg)(x) &= f(x)g(x) = (x^2 - 25)(x^2 + 2x - 15) \\ &= x^4 + 2x^3 - 15x^2 - 25x^2 - 50x + 375 \\ &= x^4 + 2x^3 - 40x^2 - 50x + 375 \end{aligned}$$

$$\begin{aligned} D_{fg} &= D_f \cap D_g \\ &= (-\infty, \infty) \cap (-\infty, \infty) \\ &= (-\infty, \infty) \end{aligned}$$

$$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{x^2 - 25}{x^2 + 2x - 15} = \frac{(x+5)(x-5)}{(x+5)(x-3)} = \frac{x-5}{x-3}$$

$$\begin{aligned} D_{\frac{f}{g}} &= D_f \cap D_g \text{ and } g(x) \neq 0 \\ &= (-\infty, -5) \cup (-5, 3) \cup (3, \infty) \end{aligned}$$

$$g(x) = 0 \quad x^2 + 2x - 15 = 0 \quad (x+5)(x-3) = 0 \quad \begin{matrix} x+5=0 \\ x=-5 \end{matrix} \quad \begin{matrix} x-3=0 \\ x=3 \end{matrix}$$

3.  $f(x)=2x^2-3x+1$  and  $g(x)=x+1$

a.  $(f \circ g)(x)$

$$\begin{aligned} &= f(g(x)) \\ &= 2(x+1)^2 - 3(x+1) + 1 \\ &= 2(x^2+x+x+1) - 3x - 3 + 1 \\ &= 2(x^2+2x+1) - 3x - 2 \\ &= 2x^2 + 4x + 2 - 3x - 2 \\ &= 2x^2 + x \end{aligned}$$

b.  $(g \circ f)(x)$

$$\begin{aligned} &= g(f(x)) \\ &= 2x^2 - 3x + 1 + 1 \\ &= 2x^2 - 3x + 2 \end{aligned}$$

c.  $(f \circ g)(1)$

$$\begin{aligned} (f \circ g)(1) &= 2(1)^2 + 1 \quad \text{or} \quad f(g(1)) \\ &= 2(1) + 1 &= f(1+1) \\ &= 2 + 1 &= f(2) \\ &= 3 &= 2(2)^2 - 3(2) + 1 \\ & &= 2(4) - 6 + 1 \\ & &= 8 - 6 + 1 \\ & &= 2 + 1 = 3 \end{aligned}$$

d.  $(g \circ f)(2)$

$$\begin{aligned} (g \circ f)(2) &= 2(2)^2 - 3(2) + 2 \quad \text{or} \quad g(f(2)) \\ &= 2(4) - 6 + 2 &= g(2(2)^2 - 3(2) + 1) \\ &= 8 - 6 + 2 &= g(2(4) - 6 + 1) \\ &= 2 + 2 &= g(8 - 6 + 1) \\ &= 4 &= g(2 + 1) \\ & &= g(3) \\ & &= 3 + 1 = 4 \end{aligned}$$

4. Find the following.

a.  $(f+g)(2)$

$$\begin{aligned} &= f(2) + g(2) \\ &= 1 + 0 \\ &= 1 \end{aligned}$$

b.  $(f-g)(1)$

$$\begin{aligned} &= f(1) - g(1) \\ &= 2 - (-2) \\ &= 2 + 2 \\ &= 4 \end{aligned}$$

c.  $(fg)(0)$

$$\begin{aligned} &= f(0) \cdot g(0) \\ &= 3(-4) \\ &= -12 \end{aligned}$$

d.  $\left(\frac{f}{g}\right)(1)$

$$= \frac{f(1)}{g(1)} = \frac{2}{-2} = -1$$

