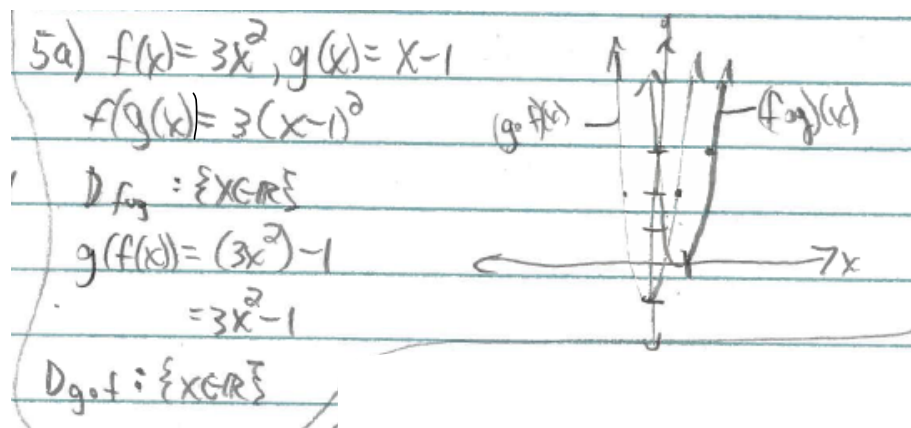


Last day's Work: pp. 552-553 #1bd, 2ad, 3bc, 5aef, 6ac, 7df

**Optional** Ch.9 Review: pp. 576-577 #2-10

- p. 552 5. In each case, functions  $f$  and  $g$  are defined for  $x \in \mathbf{R}$ . For each pair of functions, determine the expression and the domain of  $f(g(x))$  and  $g(f(x))$ . Graph each result.
- a)  $f(x) = 3x^2, g(x) = x - 1$



p. 552 6. For each of the following,

- determine the defining equation for  $f \circ g$  and  $g \circ f$
- determine the domain and range of  $f \circ g$  and  $g \circ f$

a)  $f(x) = 3x, g(x) = \sqrt{x-4}$  d)  $f(x) = 2^x, g(x) = \sqrt{x-1}$

b)  $f(x) = \sqrt{x}, g(x) = 3x+1$  e)  $f(x) = 10^x, g(x) = \log x$

c)  $f(x) = \sqrt{4-x^2}, g(x) = x^2$  f)  $f(x) = \sin x, g(x) = 5^{2x} + 1$

6a)  $f(x) = 3x, g(x) = \sqrt{x-4}$   $D_g = \{x \in \mathbb{R} \mid x \geq 4\}$

$$\begin{array}{l} (f \circ g)(x) \\ = 3\sqrt{x-4} \end{array} \quad \begin{array}{l} (g \circ f)(x) \\ = \sqrt{3x-4} \end{array}$$

$$D_{f \circ g} = \{x \in \mathbb{R} \mid x \geq 4\} \quad D_{g \circ f} = \{x \in \mathbb{R} \mid x \geq \frac{4}{3}\}$$

$$R_{f \circ g} = \{y \in \mathbb{R} \mid y \geq 0\} \quad R_{g \circ f} = \{y \in \mathbb{R} \mid y \geq 0\}$$

6c)  $f(x) = \sqrt{4-x^2}, g(x) = x^2$

$$D_f = \{x \in \mathbb{R} \mid -2 \leq x \leq 2\} \quad D_g = \{x \in \mathbb{R}\} \quad R_g = \{y \in \mathbb{R} \mid y \geq 0\}$$

$$\begin{array}{l} (f \circ g)(x) = \sqrt{4-(x^2)^2} \\ = \sqrt{4-x^4} \end{array}$$

$$\therefore 4-x^4 \geq 0 \quad \left. \begin{array}{l} x^4 \leq 4 \\ (x^2)^2 \leq 2^2 \\ \therefore x^2 \leq 2 \\ |x| \leq \sqrt{2} \end{array} \right\} \Rightarrow D_{f \circ g} = [-\sqrt{2}, \sqrt{2}]$$

$$\therefore R_{f \circ g} = [0, 2]$$

$$\therefore x^2 \leq 2$$

$$|x| \leq \sqrt{2}$$

Refer to p. 551 "Need to know"

... domain of  $f \circ g$  is subset of  $D_g$ 

6c)  $(g \circ f)(x) = (\sqrt{4-x^2})^2$

$$= 4-x^2$$

$$= -x^2 + 4 \quad \leftarrow D: (-\infty, \infty) \quad R: \{-\infty, 4\}$$

$$\therefore D_f = [-2, 2]$$

$$\therefore D_{g \circ f} = [-2, 2]$$

$$\therefore R_{g \circ f} = [0, 4]$$

$$x^2 + y^2 = r^2$$

$$x^2 + y^2 = 2^2$$

$$x^2 + y^2 = 4$$

$$y^2 = 4 - x^2$$

$$y = \pm \sqrt{4 - x^2}$$