3.1 Answer Key

Practice 3.1-1-1:

Find its composite function. Suppose $f(x) = x^2 + 1$ and $g(x) = x - 3$

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

Answer: e. $(\boldsymbol{f} \circ \boldsymbol{g})(\boldsymbol{x}) = \mathbf{2}\boldsymbol{x}^{\mathbf{2}} - \mathbf{12}\boldsymbol{x} + \mathbf{18}$

$$(f \circ g)(x) = f\big(\boldsymbol{g}(\boldsymbol{x})\big)$$

$= f(\boldsymbol{x} - \mathbf{3})$ *Use $x - 3$replaces g(x)*

$= \boldsymbol{f}(\boldsymbol{x} - \mathbf{3})$

$= 2(\boldsymbol{x} - \mathbf{3})^2$ *Use $x - 3$replaces x in function f*

$= 2(x^2 - 6x + 9)$ *Foil*

$= 2x^2 - 12x + 18$ *simplify*

Practice 3.1-2-1:

Find its composite function. Suppose $f(x) = x^2$ and $g(x) = x + 2$

$$(g \circ f)(-2)$$

Answer: $(\boldsymbol{g} \circ \boldsymbol{f})(-\mathbf{2})$**=6**

$$(g \circ f)(-2)$$

$(g \circ f)(-2) = g\big(\boldsymbol{f}(-\mathbf{2})\big)$ *Use x^2 replaces f(x) and x=-2, thus find $f(-2)$*

$$\boldsymbol{f}(-\mathbf{2}) = (-\mathbf{2})^{\mathbf{2}} = \mathbf{4}$$

$= g(\mathbf{4})$ *Use **4** replaces $\boldsymbol{f}(-\mathbf{2})$ in function f*

$= (4) + 2$ *Solve*

$= 6$

Practice 3.1-3-1:

Finding the domain of the composite function.

$(g \circ f)(x)$ where $f(x) = \frac{5}{x-1}$ and $g(x) = \frac{4}{3x-2}$

Rewrite format: $(g \circ f)(x) = g\big(f(x)\big)$

Step 1: find the domain of f(x).

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

If a function has fraction, such as $\frac{A}{B}$, then $\mathrm{B} \neq 0$

Thus $x - 1 \neq 0$

$$x \neq 1$$

Step 2: Find $g\big(f(x)\big)$

$$g\big(f(x)\big) = \frac{4}{3(\frac{5}{x-1}) - 2}$$

$$g\big(f(x)\big) = \frac{4}{\frac{15}{x-1} - 2}$$

Step 3: Find the domain of $g\big(f(x)\big)$

Since $g\big(f(x)\big) = \frac{4}{\frac{15}{x-1} - 2}$

If a function has fraction, such as $\frac{A}{B}$, then $\mathrm{B} \neq 0$

$$\frac{15}{x-1} - 2 \neq 0$$

$$\frac{15}{x-1} \neq 2$$

$(x-1)\frac{15}{x-1} \neq 2(\mathrm{x}-1)$ Multiplying the denominator x-1 on both sides to cancel the denominator

$15 \neq 2\mathrm{x}-2$ Adding 2 on both sides

$17 \neq 2\mathrm{x}$

$2\mathrm{x} \neq 17$ Dividing 2 on both sides

$\mathrm{x} \neq \frac{17}{2}$

Step 4: Overall, $\mathrm{x} \neq 1 \text{and } x \neq \frac{17}{2}$, thus the real domain of $g\big(f(x)\big)$ is

$$(-\infty, \mathbf{1}) \cup (\mathbf{1}, \mathbf{\frac{17}{2}}) \cup (\mathbf{\frac{17}{2}}, \infty)$$