Section 2.6.3
Function Composition

$fog(x)$

$f[g(x)$

- one function is "put into" another function
- the output of the first function is the input of the second

Consider- $f[g(x)]$

x is the domain of g, and g is the domain of f

Example- $f(x) = 2x + 3$ $g(x) = x - 7$

Determine $f[g(x)]$

$$= 2(x-7)+3$$
$$= 2x-14+3$$
$$= 2x-11$$

Given $f(x) = 3x-4$ and $g(x) = x^2 - 2x + 6$

Determine $(f \circ g)(x)$ $g[f(x)]$ $(g \circ f)(1)$

$= 3(x^2-2x+6)-4$

$= 3x^2-6x+18-4$

$= 3x^2-6x+14$

$= (3x-4)^2-2(3x-4)+6$

$= 9x^2-24x+16-6x+8+6$

$g[f(x)] = 9x^2-30x+30$

$gof(1) = 9(1)^2-30(1)+30$

$= 9$

Given $f(x) = \frac{2}{x-1}$ and $g(x) = \frac{3}{x}$

Determine f[g(x)] and its domain.

*in "cleaning up" do not leave answer as a complex fraction

$$\frac{2}{\frac{3}{x}-1\left(\frac{x}{x}\right)} = \frac{2}{\frac{3}{x}-\frac{x}{x}} = \frac{2}{\frac{3-x}{x}} =$$

Domain- any value not in the domain of g isn't in the domain of f[g(x)]. Also g(x) cannot equal 1 because it would make the denominator in f(x) = 0.

$$x \neq 0 \quad \begin{cases} x-1 \neq 0 \\ x \neq 1 \\ \frac{3}{x} \neq 1 \end{cases}$$

$$3 \neq x$$

$$d: (-\infty, 0) \cup (0, 3) \cup (3$$

Consider $f(x) = \frac{5}{x+4}$ $g(x) = \frac{1}{x}$

Determine the domain of $(f \circ g)(x)$

$x \neq 0$ and $x+4 \neq 0$

$x \neq -4$

$g(x) \neq -4$

$\frac{1}{x} \neq -4$

$1 \neq -4x$

$\frac{-1}{4} \neq x$

$d: (-\infty, -1/4) \cup (-1/4, 0) \cup (0,$

The number of bacteria in a refrigerated food is given by

$N(T) = 20\,T^2 - 80\,T + 500, \quad 2 \le T \le 14$

where T is the temperature of the food. When the food is removed from refrigeration, the temperature is given by

$T(t) = 4t + 2, \quad 0 \le t \le 3$

where t is the time in hours. Find N in terms of t and interpret its meaning.

omit

*How long the food has been out of refrigeration will affect the temperature and the temperature affects the number of bacteria. Therefore, the time the food has been out of refrigeration will determine the number of bacteria.

A pebble is dropped into a calm pond causing ripples in the form of concentric circles. The radius (in feet) of the outer ripple is given by $r(t) = .6t$, where t is the time in seconds after the pebble strikes the water. The area of the circle is given by the function $A(r) = \pi r^2$. Find, and interpret $(A \circ r)(t)$.

omit

Suggested Practice

Sec 2.6

page 298-299

53,57,59,61,63,67,69,

~~97a~~, ~~101b~~,

53. a. $2x+5$
    b. $2x+9$
    c. 9
    d. 13

57. a. x^4-4x^2+6
    b. x^4+4x^2+2
    c. 6
    d. 34

59. a. $-2x^2-x-1$
    b. $2x^2-17x+41$
    c. -11
    d. 15

61. a. $\sqrt{x-1}$
    b. $\sqrt{x}-1$
    c. 1
    d. $\sqrt{2}-1$

63. a. x
    b. x
    c. 2
    d. 2

67. a. $\frac{2x}{1+3x}$

b. $x \neq 0, x \neq -\frac{1}{3}$

69.
a. $\frac{4}{4+x}$

b.
$x \neq 0$
$x \neq -4$

97. a
101 b
omit