

HW #15 (2.6) 22, 24, 36, 42, 44, 46, 50, 56, 60, 66

22a) $f(x) = 3x - 5$ $g(x) = 2 - x^2$

a) $f(f(4)) = f(3(4) - 5)$
 $= f(7)$
 $= 3(7) - 5$
 $= 16$

b) $g(g(3)) = g(2 - (3)^2)$
 $= g(-7)$
 $= 2 - (-7)^2$
 $= -47$

Allman 161

thanks

-Kaylee

24) $f(x) = 3x - 5$ $g(x) = 2 - x^2$

a) $(f \circ f)(-1) = f(f(-1))$
 $= f(3(-1) - 5)$
 $= f(-8)$
 $= 3(-8) - 5$
 $= -29$

b) $(g \circ g)(2) = g(g(2))$
 $= g(2 - (2)^2)$
 $= g(-2)$
 $= 2 - (-2)^2$
 $= -2$

36) $f(x) = x^3 + 2$ $g(x) = \sqrt[3]{x}$

$(f \circ g)(x) = f(\sqrt[3]{x}) = (\sqrt[3]{x})^3 + 2 = x + 2$
 $(g \circ f)(x) = g(x^3 + 2) = \sqrt[3]{x^3 + 2}$
 $(f \circ f)(x) = f(x^3 + 2) = (x^3 + 2)^3 + 2 = x^9 + 6x^6 + 12x^3 + 10$
 $(g \circ g)(x) = g(\sqrt[3]{x}) = \sqrt[3]{\sqrt[3]{x}} = (x^{\frac{1}{3}})^{\frac{1}{3}} = x^{\frac{1}{9}}$

Domain for all:
 $(-\infty, \infty)$

42) $f(x) = \frac{1}{\sqrt{x}}$ $g(x) = x^2 - 4x$

$(f \circ g)(x) = f(x^2 - 4x) = \frac{1}{\sqrt{x^2 - 4x}}$ $D: (-\infty, 0) \cup (4, \infty)$

$(g \circ f)(x) = g(\frac{1}{\sqrt{x}}) = (\frac{1}{\sqrt{x}})^2 - 4(\frac{1}{\sqrt{x}}) = \frac{1}{x} - \frac{4}{\sqrt{x}}$ $D: (0, \infty)$

$(f \circ f)(x) = f(\frac{1}{\sqrt{x}}) = \frac{1}{\sqrt{\frac{1}{\sqrt{x}}}} = \sqrt[4]{x}$ $D: (0, \infty)$

$(g \circ g)(x) = g(x^2 - 4x) = (x^2 - 4x)^2 - 4x = x^4 - 8x^3 + 12x^2 + 16x$ $D: (-\infty, \infty)$

44) $f(x) = \frac{2}{x}$ $g(x) = \frac{x}{x+2}$

$(f \circ g)(x) = f(\frac{x}{x+2}) = \frac{2}{\frac{x}{x+2}}$
 $= \frac{2(x+2)}{x}$
 $= \frac{2x+4}{x}$
 $D: x \neq 0, -2$

$(g \circ f)(x) = g(\frac{2}{x}) = \frac{\frac{2}{x}}{\frac{2}{x} + 2}$
 $= \frac{\frac{2}{x}}{\frac{2 + 2x}{x}}$
 $= \frac{2}{2 + 2x}$
 $= \frac{1}{1 + x}$
 $D: x \neq 0, -1$

$(f \circ f)(x) = f(\frac{2}{x}) = \frac{2}{\frac{2}{x}}$
 $= x$
 $D: x \neq 0$

$(g \circ g)(x) = g(\frac{x}{x+2}) = \frac{\frac{x}{x+2}}{\frac{x}{x+2} + 2}$
 $= \frac{\frac{x}{x+2}}{\frac{x + 2(x+2)}{x+2}}$
 $= \frac{x}{3x+4}$
 $D: x \neq -2, -\frac{4}{3}$

46, 50, 56, 60, 66

46) $f(x) = \frac{1}{x}$ $g(x) = x^3$ $h(x) = x^2 + 2$

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

$= f(g(x^2 + 2)) \Rightarrow (x^2 + 2)^3 = x^6 + 6x^4 + 12x^2 + 8$

$= f(x^6 + 6x^4 + 12x^2 + 8)$

$= \frac{1}{x^6 + 6x^4 + 12x^2 + 8}$

50) $F(x) = \sqrt{x} + 1$

$f(x) = x + 1$ $g(x) = \sqrt{x}$ then $F(x) = (f \circ g)(x)$

56) $F(x) = \sqrt[3]{\sqrt{x} - 1}$

$f(x) = \sqrt[3]{x}$ $g(x) = x - 1$ $h(x) = \sqrt{x}$ then $F(x) = (f \circ g \circ h)(x)$

60) profit = revenue - cost
 \swarrow revenue

$R(x) = 0.15x - 0.000002x^2$

cost = $0.095x - 0.0000005x^2$

$P(x) = 0.15x - 0.000002x^2 - (0.095x - 0.0000005x^2)$

$= 0.055x - 0.0000015x^2$

66) a) let t = time since plane flew over radar

d = horizontal distance

Pythagorean Theorem $\Rightarrow s = f(d) = \sqrt{1 + d^2}$

b) $d = rt$

$\Rightarrow d = g(t) = 350t$

c) $s(t) = (f \circ g)(t) = f(350t) = \sqrt{1 + (350t)^2} = \sqrt{1 + 122,500t^2}$