Name: _____ Date: _____

PC: Decomposition of Functions Ms. Loughran

Do Now:

1.

For each function h given below, decompose h into the composition of two functions f and g so that $h = f \circ g.$ $= f(g(x))$

(a) $h(x) = (x+5)^2$

$g(x) = x + 5$

$f(x) = x^2$

(b) $h(x) = \sqrt[3]{5x^2 + 1}$

$g(x) = 5x^2 + 1$

$f(x) = \sqrt[3]{x}$

(c) $h(x) = 2^{\cos x}$

$g(x) = \cos x$

$f(x) = 2^x$

(d) $h(x) = \cos(2^x)$

$g(x) = 2^x$

$f(x) = \cos x$

(e) $h(x) = \dfrac{\sqrt{x^2+1}-1}{\sqrt{x^2+1}+1}$

$g(x) = x^2 + 1$

$f(x) = \dfrac{\sqrt{x}-1}{\sqrt{x}+1}$

or

$g(x) = \sqrt{x^2+1}$

$f(x) = \dfrac{x-1}{x+1}$

$f(e(x))$
$f(3x) = (3x)^2 = 9x^2$

$a(a(x))$
$a(x+1) = x+1+1 = x+2$

8. Express each of the following below as composites of two or more of the following:

$a(x) = x+1$ $\qquad$ $g(x) = x^3$ $\qquad$ $b(x) = x-2$ $\qquad$ $h(x) = \dfrac{1}{x}$

$e(x) = 3x$ $\qquad$ $k(x) = \sqrt{x}$ $\qquad$ $f(x) = x^2$

(a) $3x+1$

$a(e(x))$

(b) $3x+3$

$e(a(x))$

(c) $3x^2$

$e(f(x))$

(d) $9x^2$

$f(e(x))$ $\quad$ or $\quad e(e(f(x)))$

(e) $(x^3-2)^2$

$f\left(b(g(x))\right)$

(f) $9x+3$

$e(a(e(x)))$

(g) $\dfrac{1}{\sqrt{x^2+1}}$

$h\left(k\left(a\left(f(x)\right)\right)\right)$

(h) $x+2$

$a(a(x))$

(i) $x-1$

$b(a(x))$ or $a(b(x))$

(j) x^2-1

$a(b(f(x)))$ or $b(a(f(x)))$

(k) $3x+2$

$a(a(e(x)))$

(l) $\sqrt{x^3+1}$

$k(a(g(x)))$

(m) $\sqrt{x+1}$

$k(a(x))$

(n) $\sqrt{x}+1$

$a(k(x))$

(o) $\dfrac{1}{\sqrt{x}}$

$h(k(x))$

(p) $\dfrac{1}{\sqrt{x-2}}$

$h(k(b(x)))$

(q) $\dfrac{1}{\sqrt{x-2}}$

$h(b(k(x)))$

(r) $x^{\frac{3}{2}}$ $\quad$ 3 ← power $\quad$ 2 → root $\quad = \sqrt{x^3}$

$k(g(x))$ or $g(k(x))$

(s) $\dfrac{1}{3}x = \dfrac{x}{3}$

hint: create $\dfrac{3}{x}$ first

$3 \cdot \dfrac{1}{x}$

then flip it

$h(e(h(x)))$

Homework 10-13

Name: _____Key_____

PC: Decomposition Homework

Date: _____

Ms. Loughran

For 1 – 4, express the function in the form $f \circ g \circ h$.

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

$h(x) = \sqrt{x}$

$g(x)\ x - 1$

$f(x) = \sqrt[3]{x}$

*Remember these answers are **not** unique. You may have come up with other answers that work.*

2. $F(x) = (4 + \sqrt[3]{x})^9$

$h(x) = \sqrt[3]{x}$

$g(x)\ 4 + x$

$f(x) = x^9$

3. $F(x) = \dfrac{2}{(3 + \sqrt{x})^2}$

$h(x) = \sqrt{x}$

$g(x) = (3 + x)^2$

$f(x) = \dfrac{2}{x}$

$h(x) = 3 + \sqrt{x}$

$g(x) = x^2$

$f(x) = \dfrac{2}{x}$

4. $F(x) = \sqrt[4]{x^3 + 9}$

$h(x) = x^3$

$g(x) = x + 9$

$f(x) = \sqrt[4]{x}$

5. Find the functions f and g so that $h(x) = (f \circ g)(x)$

   (a) $h(x) = (x - 1)^3 - 2$ $g(x) = x - 1$, $f(x) = x^3 - 2$

   (b) $h(x) = 2(x + 1)^2 + 3$ $g(x) = x + 1$, $f(x) = 2x^2 + 3$

   (c) $h(x) = \dfrac{x + 1}{x + 2}$ $g(x) = x + 1$, $f(x) = \dfrac{x}{x + 1}$

6. Find the functions f, g and h so that $F(x) = (f \circ g \circ h)(x)$

$$F(x) = \sqrt{(x^2 - 3x)^5}$$

$h(x) = x^2 - 3x$

$g(x) = x^5$

$f(x) = \sqrt{x}$