Math 1120F - Fall 2014
Worksheet 1 - §6.1, 6.2

Name(s): KEY

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Work with partners in groups of 2-4. **This is required.**

1. Suppose $f(x) = \frac{x}{x+3}$ and $g(x) = \frac{2}{x}$. Find $(f \circ g)(x)$ and its domain.

$$(f \circ g)(x) = f(g(x)) = f\left(\frac{2}{x}\right) = \frac{\frac{2}{x}}{\frac{2}{x}+3}$$

$$= \frac{\frac{2}{x}}{\frac{2+3x}{x}} = \boxed{\frac{2}{2+3x} = (f \circ g)(x)}$$

$D_f : \{x \mid x \neq -3\}$

$D_g : \{x \mid x \neq 0\}$

when does $g(x) = -3$?

$$\frac{2}{x} = -3$$

$$2 = -3x \Rightarrow x = -\frac{2}{3}$$

$\therefore$ the domain of the composition function is given by domain of the "inside" function and when "inside" function "breaks" "outside" function: $\boxed{\{x \mid x \neq 0, x \neq -\frac{2}{3}\}}$

2. Suppose $H(x) = (2x+3)^4$. Find $f(x)$ and $g(x)$ such that $(f \circ g)(x) = H(x)$.

$f(x) = x^4$

$g(x) = 2x+3$

$\Rightarrow (f \circ g)(x) = (2x+3)^4$

* A different option:

$f(x) = (x+3)^4$

$g(x) = 2x$.

3. Suppose $f(x) = \dfrac{2x+3}{x+2}$. Find the inverse function of $f(x)$. State its domain and range.

$$y = \frac{2x+3}{x+2}$$

$$y(x+2) = 2x+3$$

$$yx+2y = 2x+3$$

$$yx-2x = 3-2y$$

$$x(y-2) = 3-2y$$

$$\boxed{x = \frac{3-2y}{y-2}}$$

$$D_f = R_f^{-1}$$

$$R_f = D_f^{-1}$$

$$\boxed{D_{f^{-1}} = \{x \mid x \neq 2\}}$$

$$\boxed{R_{f^{-1}} = \{x \mid x \neq -2\}}$$

4. Suppose $F(x) = \sqrt{x+1}$ and $G(x) = 3x$. Find the following values:

(a) $(F \circ F)(1)$: $\sqrt{\sqrt{2}+1}$

(b) $(G \circ F)(2)$: $3\sqrt{3}$.

a) $F(F(1)) = F(\sqrt{1+1}) = F(\sqrt{2}) = \sqrt{\sqrt{2}+1}$

b) $G(F(2)) = G(\sqrt{2+1}) = G(\sqrt{3}) = 3\sqrt{3}$.