Math 30-1 Name: _____
Relation and Functions: Composite Functions

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

1. Given $f(x) = x - 3$ $g(x) = x^2$, determine the following

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

$f(g(x))$

$f(x^2)$

$x^2 - 3$

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

$g(f(x))$

$g(x-3)$

$(x-3)^2$

$(x-3)(x-3)$

$x^2 - 6x + 9$

work from the inside out

2. Given $f(x) = x - 3$ $g(x) = x^2$, determine the following

a. $(f \circ g)(5)$

$f(g(5))$

$f(25)$

$25 - 3 = 22$

b. $(g \circ f)(5)$

$g(f(5))$

$g(2)$

$2^2 = 4$

3. Does order matter when performing a composition?

Yes!

4. Given $f(x)=x^2-3$ and $g(x)=\frac{1}{2}x$, determine the following

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

$f(g(x))$

$f\left(\frac{1}{2}x\right)=\left(\frac{1}{2}x\right)^2-3=\boxed{\frac{1}{4}x^2-3}$

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

$g(f(x))$

$=g(x^2-3)=\frac{1}{2}(x^2-3)=\boxed{\frac{1}{2}x^2-\frac{3}{2}}$

c. $(f\circ g)(5)$

$f(g(5))$

$=f\left(\frac{1}{2}\cdot 5\right)$

$=f(5/2)=(5/2)^2-3=\frac{25}{4}-\frac{12}{4}=\boxed{\frac{13}{4}}$

d. $(g\circ f)(5)$

$g(f(5))$

$=g(5^2-3)=g(22)=\frac{1}{2}\cdot 22=\boxed{11}$

e. $(g\circ g)(5)$

$g(g(5))$

$=g(5/2)=\frac{1}{2}\cdot\frac{5}{2}=\boxed{5/4}$

f. $(f\circ f)(5)$

$f(f(5))$

$f(22)=22^2-3=\boxed{481}$

5. Given the following functions, determine the following.

$f(x)=\sqrt{x}$ $g(x)=\frac{1}{x}$ $m(x)=|x|$ $n(x)=x+2$

a. $h(x)=(m\circ n)(x)$

$m(n(x))$

$m(x+2)=|x+2|$

b. $h(3)=(g(f(3)))$

$=g(\sqrt{3})=\frac{1}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}=\frac{\sqrt{3}}{3}$ Rationalized Denominator

c. $h(x)=g(n(f(x)))$

$=g(n(\sqrt{x}))$

$=g(\sqrt{x}+2)=\frac{1}{\sqrt{x}+2}\cdot\frac{(\sqrt{x}-2)}{(\sqrt{x}-2)}=\frac{\sqrt{x}-2}{x-4}$

Restriction: $x\geq 0$

d. $h(9)=(g\circ n\circ f)(9)$

$=g(n(f(9)))$

$=g(n(3))$

$=g(3+2)=g(5)=\frac{1}{5}$

e. $h(x)=(f\circ n)(x)$

$f(n(x))$

$=f(x+2)$

$=\sqrt{x+2}$

Restriction: $x+2\geq 0$

$x\geq -2$

Pg. 507 #1,2,5,6,8.