Unit 2 (2.3) Compositions Notes

Key

<u>Compositions:</u> the range of the first function becomes the domain of the second function…a series of substitutions

Recall:

if $f(x) = x^2 - 2x + 7$

then $f(5) = (5)^2 - 2(5) + 7$

so $f(5) = 22$

In other words: if the input is 5 the output is 22; $(5, 22)$

<u>To do a composition you will do substitution TWICE</u>

$g(x) = 3x - 4$ and $f(x) = x^2 - 2x + 7$

$g(f(5))$ ←do $f(5)$ first (see above), since $f(5) = 22$ substitute 22 in the place of $f(5)$

$g(22) \rightarrow 3(22) - 4$ ←do $g(22)$ second

$g(22) = 62$

Try $f(g(5))$

More Examples: $f(x) = -8x + 2$ $\quad g(x) = 2x^2 - 4$ $\quad h(x) = \frac{5x-2}{4}$

1. $f(h(6))$

$\frac{5(6)-2}{4} \rightarrow 7$

$-8(7)+2$

-54

2. $h(f(6))$

$-8(6)+2 \rightarrow -46$

$\frac{5(-46)-2}{4}$

-58

3. $g(f(-2))$

$-8(-2)+2 \rightarrow 18$

$2(18)^2-4$

644

4. $f(g(-2))$

$2(-2)^2-4 \rightarrow 4$

$-8(4)+2$

-30

Compositions of Functions: keep in mind it is just substitution

$f(x) = 4x$ $\quad g(x) = 2x - 4$ $\quad h(x) = x^2 + 1$ $\quad j(x) = \frac{1}{2}x + 2$

1. $f(g(x))$

$4(2x-4)$

$8x-16$

2. $g(f(x))$

$2(4x)-4$

$8x-4$

3. $g(h(x))$

$2(x^2+1)-4$

$2x^2+2-4$

4. $h(g(x))$

$(2x-4)^2+1$

$(2x-4)(2x-4)+1$

$4x^2-16x+16+1$

$4x^2-16x+17$

5. $g(j(x))$

$2(\frac{1}{2}x+2)-4$

$x+4-4$

x

6. $j(g(x))$

$\frac{1}{2}(2x-4)+2$

$x-2+2$

x

7. $g(g(x))$

$2(2x-4)-4$

$4x-8-4$

$4x-12$