Chapter 6.1 Notes
Composite Functions

1. Given f(x) = 3x and g(x) = $3x^2$ + 5, find the following expressions.

$f(x) = 3x$ $\quad$ $g(x) = 3x^2 + 5$

a.) $(f \circ g)(4) =$

$g(4) = 3x^2 + 5$

$3(4)^2 + 5$ ← Type into calculator

$= 53$

$f(53) = 3x$

$3(53)$ ← Type into calculator

159

b.) $(g \circ f)(2)$

$f(2) = 3x$

$3(2)$ ← Type into calculator

$= 6$

$g(6) = 3x^2 + 5$

$3(6)^2 + 5$ ← Type into calculator

113

c.) $f \circ f(1) =$

$f(1) = 3x$

$3(1)$

$= 3$

$f(3) = 3x$

$3(3)$

9

d.) $g \circ g(0) =$

$g(0) = 3x^2 + 5$

$3(0)^2 + 5$

$= 5$

$g(5) = 3x^2 + 5$

$3(5)^2 + 5$

80

2. Given $f(x) = 5x^2 - 4$ and $g(x) = 5 - 1/2\ x^2$, find the following expressions.

$f(x) = 5x^2 - 4$ $\quad$ $g(x) = 5 - \frac{1}{2}x^2$

a.) $(f \circ g)(4) =$

$g(4) = 5 - \frac{1}{2}x^2$

$= 5 - \frac{1}{2}(4)^2$ ← Type into calculator

$= -3$

$f(-3) = 5x^2 - 4$

$5(-3)^2 - 4$ ← Type into calculator

41

b.) $(g \circ f)(2) =$

$f(2) = 5x^2 - 4$

$5(2)^2 - 4$ ← Type into calculator

$= 16$

$g(16) = 5 - \frac{1}{2}x^2$

$5 - \frac{1}{2}(16)^2$ ← Type into calculator

-123

c.) $(f \circ f)(1) =$

$f(1) = 5x^2 - 4$

$= 5(1)^2 - 4$

$= 1$

$f(1) = 5x^2 - 4$

$5(1)^2 - 4$

1

d.) $(g \circ g)(0) =$

$g(0) = 5 - \frac{1}{2}x^2$

$= 5 - \frac{1}{2}(0)^2$

$= 5$

$g(5) = 5 - \frac{1}{2}x^2$

$5 - \frac{1}{2}(5)^2$

$\frac{-15}{2}$

3. Given $f(x) = 6\sqrt{x}$ and $g(x) = 2x$, find the following expressions.

$f(x) = 6\sqrt{x}$ $\quad$ $g(x) = 2x$

a.) $(f \circ g)(4) =$

$g(4) = 2x$

$= 2(4)$ ← Type into calculator

$= 8$

$f(8) = 6\sqrt{x}$

$6\sqrt{8}$ ← Type into calculator

$12\sqrt{2}$

b.) $(g \circ f)(2) =$

$f(2) = 6\sqrt{x}$

$6\sqrt{2}$ ← Type into calculator

$g(6\sqrt{2}) = 2x$

$2(6\sqrt{2})$ ← Type into calculator

$12\sqrt{2}$

c.) $(f \circ f)(1) =$

$f(1) = 6\sqrt{x}$

$6\sqrt{1}$

$f(6\sqrt{1}) = 6\sqrt{x}$

$6\sqrt{6\sqrt{1}}$

$6\sqrt{6}$

d.) $(g \circ g)(0) =$

$g(0) = 2x$

$2(0)$

0

$g(0) = 2(0)$

0

4. Given $f(x) = |x|$ and $g(x) = \frac{2}{x^2+1}$, find the following expressions.

$f(x) = |x| \qquad g(x) = \frac{2}{x^2+1}$

a.) $(f \circ g)(4) =$

$g(4) = \frac{2}{x^2+1}$

$= \frac{2}{(4)^2+1}$

$= \frac{2}{17}$

$f\left(\frac{2}{17}\right) = |x|$

$= \left|\frac{2}{17}\right|$

$\boxed{\frac{2}{17}}$

b.) $(g \circ f)(2) =$

$f(2) = |x|$

$= |2|$

$= 2$

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

$= \frac{2}{2^2+1}$

$\boxed{\frac{2}{5}}$

c.) $(f \circ f)(1) =$

$f(1) = |x|$

$= |1|$

$= 1$

$f(1) = |x|$

$= |1|$

$\boxed{1}$

d.) $(g \circ g)(0) =$

$g(0) = \frac{2}{x^2+1}$

$= \frac{2}{0^2+1}$

$= 2$

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

$= \frac{2}{2^2+1}$

$\boxed{\frac{2}{5}}$

5. If f(x) = $\sqrt{x+4}$ and g(x) = $\frac{3}{x}$, then which of the following does $(f \circ g)(x)$ equal?

$f(x) = \sqrt{x+4}$ $\quad g(x) = \frac{3}{x}$

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

$g(x) = \frac{3}{x}$

$= \frac{3}{x}$

$f\left(\frac{3}{x}\right) = \sqrt{x+4}$

$\sqrt{\frac{3}{x}+4}$

6. Find functions f and g so that $f \circ g = H$.

$H(x) = \sqrt{x^2+17}$

$f \circ g = H$

x^2+17

$\sqrt{x}$

$= \sqrt{x^2+17}$

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

$g(x) = x^2+17$

* To go from H to f(x) and g(x) you must think backwards from what you were doing in the previous questions.
* The expression under the √ will be the g(x).
* The √ will be the f(x).

* The f(x) will be whats on the outside, ex. $\sqrt{x}$, $(x)^2$, $|x|$

* The g(x) will be whats inside the √, $(\ )^2$, or $|\ |$.

7. Find functions f and g so that $f \circ g = H$.

$H = (9x+1)^6$

$f \circ g = H$

$\hookrightarrow 9x+1$

$\hookrightarrow (x)^6$

$= (9x+1)^6$

* To go from H to f(x) and g(x) you must think backwards from what you were doing in the previous questions.
* The expression inside the ( ) will be the g(x).
* The $(\ )^6$ will be the f(x).

so: $f(x) = (x)^6$

$g(x) = 9x+1$

8. Find functions f and g so that f g = H.

$H(x) = |9x+2|$

$f \circ g = H$

$\hookrightarrow 9x+2$

$\hookrightarrow |x|$

$= |9x+2|$

* To go from H to f(x) and g(x) you must think backwards from what you were doing in the previous questions.
* The expression inside the $|\ |$ will be the g(x).
* The $|\ |$ will be the f(x).

So: $f(x) = |x|$

$g(x) = 9x+2$