

**Worksheet 1.5A, Function composition**  
MATH 1410

1. Given the functions  $f$  and  $g$ , below, find the composition function  $f \circ g$ . (The function  $(f \circ g)(x)$  is the same as  $f(g(x))$ ).

(a)  $f(x) = x^2$ ;  $g(x) = \sqrt{x}$ .

(b)  $f(x) = \sqrt{x}$ ;  $g(x) = x^2$ .

(c)  $f(x) = x^2 - 1$ ;  $g(x) = x + 2$ .

(d)  $f(x) = x + 2$ ;  $g(x) = x^2 - 1$ .

(e)  $f(x) = x + 3$  and  $g(x) = x^2 - 10$

(f)  $f(x) = e^x$ ;  $g(x) = x^2$ .

(g)  $f(x) = x^2$ ;  $g(x) = e^x$ .

2. Given the functions  $f$  and  $g$ , below, find the composition functions  $f \circ g$  and  $g \circ f$ .  
(Please distinguish between your answer for  $f \circ g$  and  $g \circ f$ .)

(a)  $f(x) = x^2 + 1$  and  $g(x) = \sqrt{3}$ .

(b)  $f(x) = x^3 + 2$  and  $g(x) = \sqrt[3]{5}$ .

(c)  $f(x) = x^2 + 9$  and  $g(x) = \sqrt{x}$ .

(d)  $f(x) = x^2 + 6x + 9$  and  $g(x) = \sqrt{x}$ .

(e)  $f(x) = x^2 + 5$  and  $g(x) = \sqrt{x - 5}$ .

3. For each of the functions  $f(x)$  and  $h(x)$  below, find a function  $g(x)$  such that  $h(x) = (f \circ g)(x)$ .

(a)  $f(x) = 10^x$ ,  $h(x) = 10^{(x^2 - 17)}$ .

(b)  $f(x) = \sqrt{x}$ ,  $h(x) = \sqrt{x^2 + 4}$ .

(c)  $f(x) = x^3$ ,  $h(x) = (\sin(x))^3$

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

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

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

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

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

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