

**The University of Calgary**  
**Department of Mathematics and Statistics**  
**MATH 249**  
**Worksheet #2      Compositions of functions, Limits.**

1. For  $f(x) = \frac{1}{1-x} \left(1 - \frac{4}{x+3}\right)$  find  $\lim f(x)$ 
  - (a) as  $x \rightarrow 1$
  - (b) as  $x \rightarrow -3^+$
  - (c) as  $x \rightarrow +\infty$ .
  
2. For  $f(x) = \sqrt{9-x^2}$  and  $g(x) = \frac{3}{x-1}$  find the compositions  $g \circ g$  and  $f \circ g$  and their domains.
  
3. For  $g(x) = \frac{4}{2x-8}$  and  $f(x) = \sqrt{x^2-9}$  find  $g \circ g$  and  $g \circ f$  and their domains
  
4. Find :  $\lim \frac{1-4x^2}{6x^2-5x+1}$ 
  - (a) as  $x \rightarrow -\infty$
  - (b) as  $x \rightarrow \frac{1}{2}$
  - (c) as  $x \rightarrow \frac{1}{3}^-$ .
  
5. Find :  $\lim \frac{\sqrt{3x}-3}{\sqrt{2x^2-6x}}$ 
  - (a) as  $x \rightarrow 3^+$
  - (b) as  $x \rightarrow +\infty$
  - (c) as  $x \rightarrow 0$ .
  
6. For  $f(x) = \frac{\sqrt{3-x}}{x^2-4x+3}$  find  $\lim f(x)$ 
  - (a) as  $x \rightarrow 3^-$
  - (b) as  $x \rightarrow 1^+$
  - (c) as  $x \rightarrow +\infty$ .
  
7. For  $g(x) = \sqrt{3+x}$  and  $f(x) = \sqrt{x-5}$  find the compositions  $g \circ g$  and  $f \circ g$  and their domains.
  
8. For  $f(x) = \frac{|x-3| - |x+3|}{x}$  find  $\lim f(x)$ 
  - (a) as  $x \rightarrow 0$
  - (b) as  $x \rightarrow -\infty$
  - (c) as  $x \rightarrow +\infty$ .
  
9. For  $g(x) = \sqrt{3-x}$  and  $f(x) = \frac{6}{3x-1}$  find the compositions  $g \circ f$  and  $f \circ f$  and their domains