University of Calgary      3.1
Faculty of Science
Department of Mathematics and Statistics

Math 249      Fall 2005

## Worksheet 3 (Functions and Limits)

1. Find the domain and range of each of the relations. Say whether or not the relation is a function and give reasons for your answer.

     a.      $f(x) = \sqrt{x^2 - 4}$

     b.      $f(x) = \sqrt{6x - x^2}$

     c.      $f = \{(x, y) : x^2 - y^2 = 16\}$

     d.      $f(x) = \dfrac{|2x - 3|}{6 - 4x}$

     e.      $f(x) = \dfrac{1}{x - 4}$

     f.      $f(x) = \dfrac{1}{(x - 2)^2}$

     g.      $f(x) = \sqrt{2 - \sqrt{x}}$

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

2. Find each of the following limits if they exist. If they do not exist, give reasons for your answers.

     a.      $\lim\limits_{x \to -2} (3x^2 - 2x + 7)$

     b.      $\lim\limits_{x \to 2} \left( 4x^2 - \dfrac{2}{x} \right)$

     c.      $\lim\limits_{x \to 2} \left( \dfrac{x^2 + x - 6}{x^2 + 3x - 10} \right)$

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3.2

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d. $\quad \lim\limits_{x \to 1} \left( \dfrac{\sqrt{3x + 4} - \sqrt{5x + 2}}{\sqrt{2x^2 + 7x - 3}} \right)$

e. $\quad \lim\limits_{x \to 2} \left( \dfrac{4x - 8}{\sqrt{2x + 5} - \sqrt{x^2 + 5}} \right)$

f. $\quad \lim\limits_{x \to 3} \left( \dfrac{|x - 3|}{x - 3} \right)$

g. $\quad \lim\limits_{x \to 0} \left( \dfrac{1}{x\sqrt{1 + x}} - \dfrac{1}{x} \right)$

h. $\quad \lim\limits_{x \to 0^-} \left( \dfrac{1}{x} - \dfrac{1}{|x|} \right)$

i. $\quad \lim\limits_{x \to 0^+} \left( \dfrac{1}{x} - \dfrac{1}{|x|} \right)$

j. $\quad \lim\limits_{x \to 1} \left( \dfrac{x^2 - 1}{|x - 1|} \right)$

k. $\quad \lim\limits_{x \to 2} \left( \dfrac{\sqrt{6 - x} - 2}{\sqrt{3 - x} - 1} \right)$

3. Find $a$ so that $\lim\limits_{x \to -2} f(x)$ exists when $f(x) = \dfrac{3x^2 + ax + a + 3}{x^2 + x - 2}$