Department of Mathematics, Bennett University
Engineering Calculus (EMAT101L)
Tutorial Sheet 4 (Limit)

1. Evaluate:
   (a) $\lim\limits_{x\to-1} \frac{(x+2)(3x-1)}{x^2+3x-2}$
   (b) $\lim\limits_{x\to0} \frac{\sqrt{4+x}-2}{x}$
   (c) $\lim\limits_{x\to1} \frac{x^2-1}{x-1}$
   (d) $\lim\limits_{x\to2} \frac{(4-x^2)}{3-\sqrt{x^2+5}}$
   (e) $\lim\limits_{x\to0} \frac{\sin 2x+\sin 6x}{\sin 5x-\sin 3x}$
   (f) $\lim\limits_{x\to a} \frac{\sin x-\sin a}{x-a}$
   (g) $\lim\limits_{x\to0} \frac{\sec x-1}{\tan^2 x}$
   (h) $\lim\limits_{x\to\frac{\pi}{2}} \sec x - \tan x$

   (i) $\lim\limits_{x\to1} f(x)$ where f(x)=$\begin{cases} 4-2x & x<1 \\ 6x-4 & x\geq1 \end{cases}$

   (k) $\lim\limits_{x\to0} \frac{\tan 3x}{\sin 8x}$

2. Show that each of the following limits does not exist:

   (a) $\lim\limits_{x\to1} \frac{x-1}{|x-1|}$
   (b) $\lim\limits_{x\to2} f(x)$ where f(x)=$\begin{cases} x+3 & x\leq2 \\ -2x+5 & x>2 \end{cases}$
   (c) $\lim\limits_{x\to0} e^{\frac{1}{x}}$
   (d) $\lim\limits_{x\to0} x + \text{sgn}(x)$
   (e) $\lim\limits_{x\to0} \frac{\sin x}{|x|}$

3. For what values of a, $\lim\limits_{x\to2^-} f(x) = \lim\limits_{x\to2^+} f(x)$ where

$$f(x) = \begin{cases} a^2x - 2a & x\geq2 \\ 12 & x<2 \end{cases}$$

4. For what values of a, $\lim\limits_{x\to3^-} f(x) = \lim\limits_{x\to3^+} f(x)$ where

$$f(x) = \begin{cases} x^2-1 & x<3 \\ 2ax & x\geq3 \end{cases}$$