INTRODUCTION TO LIMITS

1 Evaluate each limit.

(a) $\lim_{x\to 3}(3x)$ (b) $\lim_{x\to -1}\left(x^2+4x\right)$ (c) $\lim_{x\to 3}\left(9-x^2\right)$ (d) $\lim_{x\to -2}\left(x^2-2x+1\right)$

(e) $\lim_{x\to -4} x^2(x+2)$ (f) $\lim_{h\to 2}\left(h^2-4h+4\right)$ (g) $\lim_{a\to -1}(a+3)(a-4)$ (h) $\lim_{x\to 3}\left(\frac{x^2-5}{x+2}\right)$

2 The value of $\lim_{x\to -3}\frac{(x+5)(x+3)}{x+3} = \ldots$

A -2 **B** 0 **C** 2 **D** indeterminate

3 Evaluate the following limits.

(a) $\lim_{x\to 3} 1$ (b) $\lim_{x\to 0}\left(\frac{x^2+5x}{x}\right)$ (c) $\lim_{x\to -2}\left(\frac{x^3+8}{x+2}\right)$

(d) $\lim_{x\to 3}\left(\frac{x^2-5x+6}{x-3}\right)$ (e) $\lim_{x\to 3}\left(\frac{3x}{x+3}\right)$ (f) $\lim_{x\to 5}\left(\frac{x-5}{2x^2-9x-5}\right)$

(g) $\lim_{x\to 1}\left(\frac{x-1}{x^2+x-2}\right)$ (h) $\lim_{x\to 4}\left(\frac{x-1}{x^2+x-2}\right)$ (i) $\lim_{x\to 1}\left(\frac{x^3-1}{x-1}\right)$

4 Evaluate each limit.

(a) $\lim_{x\to 0} f(x)$ where $f(x)=\begin{cases} x^2+1 & \text{for } x\geq 0 \\ 1 & \text{for } x<0 \end{cases}$

(b) $\lim_{x\to 1} f(x)$ where $f(x)=\begin{cases} 2x & \text{for } x\geq 1 \\ -2x+4 & \text{for } x<1 \end{cases}$

5 Evaluate $\lim_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ where:

(a) $f(x)=x^2-1$ **(b)** $f(x)=2x^2-3x+2$

5 Evaluate $\lim_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ where:

(c) $f(x)=x^3$ **(d)** $f(x)=x(6-x)$

6 Show that the following limits do not exist:

(a) $\lim\limits_{x\to 0}\dfrac{1}{x}$	**(b)** $\lim\limits_{x\to 0} f(x)$ where $f(x)=\begin{cases}0 & \text{for } x<0\\ 1 & \text{for } x>0\end{cases}$	**(d)** $\lim\limits_{x\to 0} f(x)$ where $f(x)=\begin{cases}x^2+1 & \text{for } x>0\\ 2 & \text{for } x<0\end{cases}$

7 The function whose graph is shown is:

A discontinuous at $x=0$
B continuous for all x
C discontinuous at $x=2$
D continuous for all $x>0$ but discontinuous at $x=1$