MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 1 **MATHEMATICS 1000** FALL 2025

SOLUTIONS

[14] 1. (a) $f(0) = 0$

(b) $\lim_{x \to 0^-} f(x) = 0$

(c) $\lim_{x \to 0^+} f(x) = 0$

(d) $\lim_{x \to 0} f(x) = 0$

(e) $f(-1) = 1$

(f) $\lim_{x \to -1^-} f(x) = -3$

(g) $\lim_{x \to -1^+} f(x) = 1$

(h) $\lim_{x \to -1} f(x)$ does not exist (because the one-sided limits do not agree)

(i) $f(2)$ is undefined

(j) $\lim_{x \to 2^-} f(x) = -2$

(k) $\lim_{x \to 2^+} f(x) = -2$

(l) $\lim_{x \to 2} f(x) = -2$

(m) $f(3)$ is undefined

(n) $\lim_{x \to 3^-} f(x) = \infty$

(o) $\lim_{x \to 3^+} f(x) = \infty$

(p) $\lim_{x \to 3} f(x) = \infty$

[3] 2. (a) First we consider values to the left of $x = -4$:

x	-5	-4.5	-4.1	-4.01	-4.001	-4.0001
$f(x)$	5.5455	5.4250	5.3489	5.3348	5.3335	5.3333

and then values to the right of $x = -4$:

x	-3	-3.5	-3.9	-3.99	-3.999	-3.9999
$f(x)$	5.2857	5.2813	5.3193	5.3319	5.3332	5.3333

We can deduce that

$$\lim_{x \to -4^-} f(x) = 5.333\ldots = \frac{16}{3} \quad \text{and} \quad \lim_{x \to -4^+} f(x) = \frac{16}{3},$$

and since these agree, we can conclude that

$$\lim_{x \to -4} f(x) = \frac{16}{3}.$$

[3] (b) First we consider values to the left of $x = \frac{1}{2}$:

x	-0.5	0	0.4	0.49	0.499	0.4999
$f(x)$	9.1250	16	72.8	714.005	7126.5	71251.5

and then values to the right of $x = \frac{1}{2}$:

x	1.5	1	0.6	0.51	0.501	0.5001
$f(x)$	-6.125	-13	-69.8	-711.005	-7123.5	-71248.5

We can deduce that

$$\lim_{x \to \frac{1}{2}^-} f(x) = \infty \quad \text{and} \quad \lim_{x \to \frac{1}{2}^+} f(x) = -\infty.$$

Since these disagree, we can only write that $\lim_{x \to \frac{1}{2}} f(x)$ does not exist.