MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 1 **MATHEMATICS 1000** FALL 2023

SOLUTIONS

[14] 1. (a) $f(3) = 3$

(b) $\lim_{x\to 3^-} f(x) = 4$

(c) $\lim_{x\to 3^+} f(x) = 4$

(d) $\lim_{x\to 3} f(x) = 4$

(e) $f(0) = 0$

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

(g) $\lim_{x\to 0^+} f(x) = 4$

(h) $\lim_{x\to 0} f(x)$ does not exist (because the one-sided limits are not equal)

(i) $f(-1)$ is undefined

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

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

(l) $\lim_{x\to -1} f(x)$ does not exist

(m) $f(-2) = -2$

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

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

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

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

x	3	3.5	3.9	3.99	3.999
$f(x)$	1.4	1.3636	1.3390	1.3339	1.3333

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

x	5	4.5	4.1	4.01	4.001
$f(x)$	1.2857	1.3077	1.3279	1.3328	1.3333

We can deduce that

$$\lim_{x\to 4^-} f(x) = 1.\overline{3} = \frac{4}{3} \quad \text{and} \quad \lim_{x\to 4^+} f(x) = \frac{4}{3},$$

and since these agree, we can conclude that

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

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

x	-3	-2.5	-2.1	-2.01	-2.001	-2.0001
$f(x)$	-1	-3	-19	-199	-1999	-19999

and then values to the right of $x = -2$:

x	-1	-1.5	-1.9	-1.99	-1.999	-1.9999
$f(x)$	3	5	21	201	2001	20001

We can deduce that

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

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