MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECTION 1.6 **Math 1000 Worksheet** FALL 2025

For practice only. Not to be submitted.

1. Determine whether the function

$$f(x) = \begin{cases} \dfrac{x^2+4}{2x^2+4} & \text{if } x \le -2 \\ \dfrac{x^2-4}{2x+4} & \text{if } -2 < x \le 1 \\ \dfrac{x^2-4}{x^2-9x+14} & \text{if } x > 1 \end{cases}$$

is continuous at the indicated point. If it is not, classify the discontinuity as removable or non-removable.

(a) $x = -2$

(b) $x = 1$

(c) $x = 2$

2. Find all values of the constant k which would make $f(x)$ continuous at $x = 1$, given

$$f(x) = \begin{cases} \dfrac{x^2+(k-1)x-k}{x-1} & \text{if } x \ne 1 \\ 2k+3 & \text{if } x = 1. \end{cases}$$

3. Find all values of the constant k which would make $f(x)$ continuous at $x = 2$, given

$$f(x) = \begin{cases} k^2x - 5 & \text{if } x \ge 2 \\ \dfrac{1}{x-4} & \text{if } x < 2. \end{cases}$$

4. Find all values of the constant k which would make $f(x)$ continuous at $x = 0$, given

$$f(x) = \begin{cases} \dfrac{\sqrt{kx^2+1}-1}{3x^2} & \text{if } x \ne 0 \\ k + \dfrac{5}{6} & \text{if } x = 0. \end{cases}$$

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5. For each function $f(x)$, use the definition of continuity to determine all points at which $f(x)$ is not continuous. Classify any discontinuities.

(a) $f(x) = \begin{cases} \dfrac{x^2-4}{x-2} & \text{if } x \neq 2 \\ 0 & \text{if } x = 2 \end{cases}$

(b) $f(x) = \begin{cases} \dfrac{x+1}{x^2-x-2} & \text{if } x < 1 \\ 2 & \text{if } x = 1 \\ 3 - x^2 & \text{if } x > 1 \end{cases}$

(c) $f(x) = \begin{cases} \dfrac{x}{x^2-5x} & \text{if } x < 1 \\ \dfrac{2}{x-9} & \text{if } x \geq 1 \end{cases}$

6. Show that $f(x) = 3 + 4x^2 - 5x^3$ has at least one root on the interval $[-2, 2]$.