

Math 17A  
Vogler  
Worksheet 1

1.) Use the three-step definition of continuity for each of the following problems.

a.) Let  $f(x) = \begin{cases} x^2 + 3 & , \text{ if } x \neq -1 \\ 2 & , \text{ if } x = -1. \end{cases}$  Determine if  $f$  is continuous at  $x = -1$ .

b.) Let  $g(x) = \begin{cases} x + 1 & , \text{ if } x \geq 0 \\ 2 - x^2 & , \text{ if } x < 0. \end{cases}$  Determine if  $g$  is continuous at  $x = 0$ .

c.) Let  $f(x) = \begin{cases} x - 2 & , \text{ if } x > 1 \\ 0 & , \text{ if } x = 1 \\ -x & , \text{ if } x < 1. \end{cases}$  Determine if  $f$  is continuous at  $x = 1$ .

2.) Use approved shortcuts and facts from class to determine (with a brief explanation) the  $x$ -values for which each of the following functions is continuous.

a.)  $f(x) = x^5 + x^4 + x^3 + x^2 + x + 1$       b.)  $g(x) = \frac{\sin x}{x^2 + 4}$

c.)  $f(x) = \frac{x + 3}{x^2 - 4}$       d.)  $g(x) = \cos(x^3 - x)$

3.) Determine constants  $A$  and  $B$  so that each of the following functions is continuous for all values of  $x$ . Start by drawing a “fake” graph. Then use limits.

a.)  $f(x) = \begin{cases} \frac{x^2 - 7x + 6}{x - 6} & , \text{ if } x \neq 6 \\ A & , \text{ if } x = 6. \end{cases}$

b.)  $f(x) = \begin{cases} A^2x - A & , \text{ if } x \geq 1 \\ 2 & , \text{ if } x < 1. \end{cases}$

c.)  $f(x) = \begin{cases} \frac{A + x}{A + 1} & , \text{ if } x < 0 \\ Ax^3 + 3 & , \text{ if } x \geq 0 \end{cases}$

d.)  $f(x) = \begin{cases} 3 & , \text{ if } x \leq 1 \\ Ax^2 + B & , \text{ if } 1 < x \leq 2 \\ 5 & , \text{ if } x > 2 \end{cases}$

e.)  $f(x) = \begin{cases} Ax - B & , \text{ if } x \leq -1 \\ 2x + 3A + B & , \text{ if } -1 < x \leq 1 \\ 4 & , \text{ if } x > 1 \end{cases}$