

Math 21A  
Kouba  
Discussion Sheet 1

1.) Use a calculator to determine the value of  $\lim_{x \rightarrow 0} \frac{10^x - 1}{x}$  to three decimal places. Do not use L'Hopital's rule.

2.) Write the surface area of a sphere as a function of its volume. Use your result to find the surface area of a sphere of volume  $9\pi$  cubic feet.

3.) Solve the following inequality for  $x$ :  $x(x - 1)^3(x + 2)^2 \leq 0$ .

4.) Determine the domain and range for each function and sketch (Do this without a graphing calculator, if possible, then check your answer with a calculator.) its graph.

a.)  $f(x) = |x - 1|$       b.)  $f(x) = |x - 1| + |x + 5|$

c.)  $f(x) = \sqrt{x - 3}$       d.)  $f(x) = x^2 - 3x$

e.)  $f(x) = \sqrt{x^2 - 3x}$       f.)  $g(x) = 2 \sin(\pi x)$

g.)  $h(x) = 3 + e^{-2x}$       h.)  $g(x) = \frac{3}{1 + e^{-2x}}$

i.)  $g(x) = \ln(x - 4)$

5.) Create (define) your own function having the following two properties :

a.) Domain : all x-values ; Range :  $-2 \leq y \leq 2$

b.) Domain : all x-values ; Range :  $0 \leq y \leq 6$

c.) Domain : all x-values ; Range :  $1 < y < 6$  (Hint: problem 4.)h.) might be of use here.)

6.) Determine all constants K so that the  $\lim_{x \rightarrow -1} f(x)$  exists. Then graph the function(s).

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

7.) Determine the following limits.

b.)  $\lim_{x \rightarrow -2} \frac{3 - \sqrt{7 - x}}{x + 2}$

b.)  $\lim_{x \rightarrow 1} \frac{x^4 - 1}{x^3 - 1}$

c.)  $\lim_{x \rightarrow -\infty} \frac{x + 100,000}{\sqrt{x^2 + 4}}$

8.) In class we "guessed" that  $\lim_{x \rightarrow 1} \frac{x^{1/3} - 1}{1 - x^{1/2}} = -\frac{2}{3}$ . Verify this algebraically.

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The following problem is for recreational purposes only.

9.) Divide the following trapezoid into four (4) identical (size and shape) pieces.

