

Honors Calc. I. Homework Set #3 Due 9/19/07 Name: \_\_\_\_\_

1. §2.5, p.107, #43: Find the values of  $a$  and  $b$  that make  $f(x)$  continuous everywhere

$$f(x) = \begin{cases} \frac{x^2}{x-2} & \text{if } x < 2 \\ ax^2 - bx + 3 & \text{if } 2 < x < 3 \\ 2x - a + b & \text{if } x \geq 3. \end{cases}$$

2. §2.5, p. 107, #54: Prove that  $\sqrt{x-5} = \frac{1}{x+3}$  has at least one real root, then use your calculator to find this root correct to 3 decimal places.

3. §3.1, p.120, #15: The displacement (in meters) of a particle moving in a straight line is given by the equation of motion  $s = 1/t^2$ , where  $t$  is measured in seconds. Find the velocity of the particle at times  $t = a$ ,  $t = 1$ ,  $t = 2$ , and  $t = 3$ .

4. §3.2, p.132, #24: Find  $f'(a)$  given  $f(x) = \frac{3+x}{1-3x}$ .

5. §3.2, p. 134, #8: The derivative of  $f(x)$  at  $x = a$ ,  $f'(a)$ , exists if and only if the derivative exists from the left and from the right and they are equal, that is  $f'_-(a) = \lim_{h \rightarrow 0^-} \frac{f(a+h) - f(a)}{h} = f'_+(a) = \lim_{h \rightarrow 0^+} \frac{f(a+h) - f(a)}{h}$ . Given  $f(x) =$

$$\begin{cases} 0 & \text{if } x \leq 0 \\ 5 - x & \text{if } 0 < x < 4 \\ \frac{1}{5-x} & \text{if } x \geq 4 \end{cases}$$

- (a) find  $f'_-(4)$  and  $f'_+(4)$ .  
 (b) sketch the graph of  $f(x)$   
 (c) state where  $f(x)$  is discontinuous  
 (d) where  $f(x)$  is not differentiable.