

Math 1450, Honor Calculus Practice4, Fall 2015.

September 23, 2015

PSID: \_\_\_\_\_ Name: \_\_\_\_\_

1. Show that the equation  $4x^5 + x^3 + 2x + 1 = 0$  has exactly one real root.

2. If  $f''$  is continuous, show that

$$\lim_{h \rightarrow 0} \frac{f(x+h) - 2f(x) + f(x-h)}{h^2} = f''(x).$$

3. Investigate the family of polynomials given by the equation  $f(x) = 2x^3 + cx^2 + 2x$ . For what values of  $c$  does the curve have maximum and minimum points?

4. A cone-shaped drinking cup is made from a circular piece of paper of radius  $R$  by cutting out a sector and joining the edges  $CA$  and  $CB$ . Find the maximum capacity of such a cup.

