MATH 111

PRACTICE EXAM 1

(1) Find the equation of the line through $(3, 0)$ that is normal to the parabola $y = x^2$.

(2) Find the local minima, local maxima, and inflection points of the function

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

(3) A wire with length 3 m is used for making a circle and an equilateral triangle. How should this be done if the sum of the areas of circle and triangle is maximal?

(4) Consider the functions $f(x) = \sqrt{x+a}$ and $g(x) = |x|$.
   (a) Which condition on a must be satisfied so that that graphs of f and g enclose a nonzero area?
   (b) Assuming that this condition is satisfied, compute the area enclosed by f and g.