Mathematics 110 – Calculus of one variable
Trent University 2003-2004

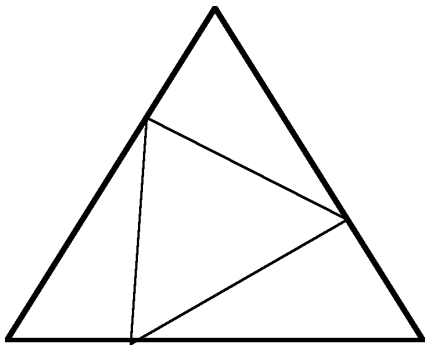
ASSIGNMENT #2
Due: Wednesday, 29 October, 2003

Odds and ends

It is noted in the text that $f(x) = \sin\left(\frac{1}{x}\right)$ is not continuous at $a = 0$, from which it follows that is not differentiable at $a = 0$. By way of contrast, $g(x) = x\sin\left(\frac{1}{x}\right)$ is continuous, but not differentiable at $a = 0$. Your task, should you choose to accept it, is:

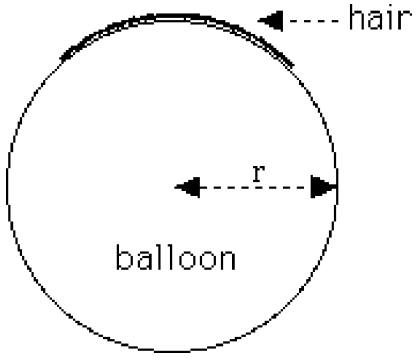
1. Check that $h(x) = x^2 \sin\left(\frac{1}{x}\right)$ is differentiable (and hence continuous) at $a = 0$. *[2]*

Suppose an equilateral triangle is inscribed inside an equilateral triangle with sides of length 1.



2. What is the minimum area of such an inscribed triangle? *[4]*

A hair 2π *cm* long lies as straight as possible on the surface of a spherical balloon while it is being inflated. The balloon remains spherical at all times, and the hair, which doesn't stretch or shrink, remains as straight as possible on its surface.



3. How is the radius of the balloon changing when it is 4 *cm*, if the ends of the hair are moving apart at 1 *cm/s* at that instant? *[2]*

4. At the same instant, how quickly is the midpoint of the hair aproaching the line between the two ends? *[2]*