Week 56 (10/6/03)

Stirling's formula

Using $N! = \int_0^\infty x^N e^{-x} dx$ (which you can prove by induction), derive Stirling's formula,

$$N! \approx N^N e^{-N} \sqrt{2\pi N}.$$

Also, find the order-$1/N$ correction to this (and the order-$1/N^2$ correction, if you really want to).