Course 2BA1: Academic Year 2000–1.

Assignment IV.

To be handed in by Friday 13th April, 2001.
Please include both name and student number on any work handed in.

1. Devise a context-free grammar to generate the language over the alphabet $\{X, 0, 1\}$ consisting of the strings

   $$X,\ 0X1,\ 00X11,\ 000X111,\ 0000X1111, \ldots$$

   (i.e., consisting of m zeros, for some non-negative integer m, followed by 'X' followed by m ones). You should specify the nonterminals of the grammar, the start symbol and the productions of the grammar.

2. Find the general solution of the differential equation

   $$(1 + x^2)\frac{dy}{dx} + 2xy = 1.$$

3. Find the general solution of the ordinary differential equation

   $$\frac{d^2y}{dx^2} - 9\frac{dy}{dx} + 14y = \cos 3x.$$