Math315 Assignment 2

October 29th, 2008

Answer all questions and give complete reasons and checks for your answers. Hand in ALL of your rough working together with your final answers. The parts of the questions are weighted as shown on the right of the question. Use of Maple is encouraged where appropriate. You are reminded that plagiarism is a serious offense and when caught you will suffer the penalties specified by the University.

1. Solve this recurrence using the generating function method: $b_{n+1} = cb_n + d$ where $b_0 = e$, where c, d and e are the last 3 non-zero digits in your registration number. [6]

2. A polynomial in y is produced using this formula:

$$f(n) := \sum_{k\geq 0} \sum_{r} \binom{r}{k-r} \binom{n}{r} y^k$$

   (a) Evaluate the polynomials $f(0)$, $f(1)$ and $f(2)$ and predict a formula for $f(n)$. [4]

   (b) Form the generating function

$$F(x) := \sum_{n\geq 0} f(n)x^n$$

   and hence use the snake oil method to prove a formula for $f(n)$. [7]

   (c) Use snake oil for $g(n)$ to show it is the same as $f(n)$. [8]

$$g(n) := \sum_{k\geq 0} \sum_{j} \binom{\lfloor \frac{j}{2} \rfloor}{k-j} \binom{n-k+\lfloor \frac{3j}{2} \rfloor}{j} y^k$$