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**Challenge Exercise 4**  
**MATH 1281 – 2010/11**  
**Due Date: March 18, 2011**

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These challenge exercises ask you questions about material covered in class, but at a greater depth. You are not required to do this exercise; it is intended as extra work. However, you will receive extra credit if you complete the problem correctly.

When handing this assignment in, please clearly label your work as a Challenge Exercise. Make sure to include your name.

**Problem.**

- (1) [5pts] Let  $f_n$  denote the  $n$ th Fibonacci number. Show that if  $a_n = a_{n-1} + a_{n-2}$ ,  $a_0 = s$  and  $a_1 = t$ , where  $s$  and  $t$  are constants, then

$$a_n = sf_{n-1} + tf_n \text{ for all } n \geq 0$$

- (2) [5pts] Let  $\mathcal{M}_{m \times n}$  be the set of  $m \times n$  matrices of size  $m \times n$ . If  $M, N \in \mathcal{M}$ , we write  $M \leq N$  if  $m_{ij} \leq n_{ij}$  for all  $1 \leq i \leq m$  and  $1 \leq j \leq n$ . Prove that  $\leq$  is a partial order on the set  $\mathcal{M}_{m \times n}$ .