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## Fundamental Algorithms

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*Deadline: November 07, 2007*

### Problem 1 (10 Points)

Consider the following recurrence relation:

$$\begin{aligned}g_1 &= 1 \\g_2 &= 2 \\g_n &= g_{n-1} \cdot g_{n-2} ; n \geq 3\end{aligned}$$

What is  $g_n$  as a function of fibonacci number? Prove your claim.

### Problem 2 (10 Points)

Consider the following:

$$\begin{aligned}g_1 &= 1 \\g_2 &= 1 \\g_n &= (n-1) \cdot g_{n-1} + (n-2) \cdot g_{n-2} + \dots + 1 \cdot g_1 ; n \geq 3\end{aligned}$$

What is  $g_n$  as a function of  $n$ ? Prove your claim.

(Extra: Prove: If  $g_2 = 2$ , then  $g_n = \frac{n! \cdot 5}{3!}$ )

### Problem 3 (10 Points)

Give, in Landau notation, the relationships between every pair of the following functions.  
 $n$ ,  $\lg n$ ,  $n^2$ ,  $n \lg n$  and  $2^n$ .