You are allowed to work in groups, but the solutions you hand in should be written by you only. If you work in a group, you must write the names of your collaborators at the top of your assignment. Explain your reasoning to receive full credit. All problems are worth 10 points. You are strongly encouraged to type your solutions in LaTeX. In any case, please staple your psets!

P1, 2 As noted on website.

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P3 Let $t_n$ be the number of ways of tiling a $2 \times n$ rectangle with $2 \times 1$ dominoes. Prove that

$$t_n = \sum_{k=0}^{[n/2]} \binom{n-k}{k}.$$  

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P4 Prove combinatorially that

$$(a) \sum_{k=0}^{n} k \binom{n}{k} = n2^{n-1};$$

(b) the number of permutations of the multiset $\{1^{a_1}, 2^{a_2}, \ldots, m^{a_m}\}$ is $\binom{n}{a_1,\ldots,a_m}$ where $n = a_1 + \cdots + a_n.$