Presentations05

Read the notes on the class website about the limit point game and be prepared to play a game with another student.	1-3
Find the Maclaurin expansion for e^x, $\sin x$ and $\cos x$. Then substitute $x \leftarrow ix$ to obtain the identity $e^{ix} = \cos x + i \sin x$; then repeat with $x \leftarrow -ix$ to get another identity; finally solve two equations in two unknowns to get $\sin x$ and $\cos x$ in terms of e^{ix} and e^{-ix}.	2
Consider the equation $(x + iy)^2 = 0 + 1i$. Set up two equations in x and y and find real numbers that satisfy the equations.	3
Prove de Moivre's theorem: $$(\cos x + \mathrm{i} \sin x)^n = \cos nx + i \sin nx$$ Where $i = \sqrt{-1}$. Hint: use induction.	4
Look up the hyperbolic trig functions, sinh and cosh; prove the identity: $$\mathrm{cosh\^{}2}(x) - \sinh^2(x) = 1$$	5
Prove that the sum of all the elements in a row of Pascal's triangle is an integral power of 2. Hint: try induction.	6
Suppose that two chess players made a wager for $100 on some coin tosses: so that player A wins if the coin lands "heads" and player B wins if the coin lands "tails." They agree that the first to get six wins gets the whole pot of $200. The game is interrupted when play A has had 2 wins and player B has 4 wins. How should the pot be fairly divided between the two of them?	7
Use the fact that $$\binom{n}{k} = \frac{n!}{k!\,(n-k)!}$$ to obtain the identity $$\binom{n}{k} = \binom{n-1}{k-1} + \binom{n-1}{k}$$	8
In your textbook select some problems in the section on the history of the development of probability theory, select some problems to do.	9