Problem Set 2. Due 9/18

1. Prove that for all positive integers n, the number $\binom{2n}{n}$ is even.

2. Prove that for all positive integers n,

$$n\binom{2n-1}{n-1} = \sum_{k=1}^{n} k\binom{n}{k}^2.$$

3. Find a closed formula for

$$\sum_{k=0}^{n} \frac{1}{k+1}\binom{n}{k} t^{k+1},$$

where n is a positive integer and t is a real number.

4. What digits are immediately on the left and right of the decimal point in $(\sqrt{11}+\sqrt{10})^{2018}$? (*Hint: also consider* $(\sqrt{11}-\sqrt{10})^{2018}$)

More problems will be posted by Thursday. Please check back.