

**MATH 144, HANDOUT 2:
SOME INDUCTION PROBLEMS**

Exercise 1. Prove the following statement:

$$\text{For all integers } n \geq 1, \frac{1}{1 \cdot 3} + \frac{1}{3 \cdot 5} + \frac{1}{5 \cdot 7} + \cdots + \frac{1}{(2n-1)(2n+1)} = \frac{n}{2n+1}.$$

Exercise 2. Prove the following statement:

For all integers $n \geq 0$, $3^{2n} - 1$ is divisible by 8.

Exercise 3. For all integers $n \geq 2$, $2^n < (n + 1)!$.

Exercise 4. For all integers $n \geq 2$, $2 \cdot 9^n - 10 \cdot 3^n$ is divisible by 4.