Mathematics 300 Homework, February 28, 2022.

For the quiz on Monday you will have to give a proof that $\sqrt{2}$ is irrational. I will also choose a problem from of the following:

Problem 1. If β is irrational, then so is $\dfrac{\beta + 2}{\beta - 1}$.

Problem 2. We have shown several times that the product of two odd numbers is odd. Use this to prove: If a, b, c, d are odd integers, then so is the product $abcd$.

Problem 3. (a) Define $a \equiv b \pmod{n}$ where a, b, n are integers and $n \neq 0$. (b) Prove: If $a \equiv 3 \pmod 5$ and $b \equiv 2 \pmod 5$, then $a - b \equiv 1 \pmod 5$.

Problem 4. If $n^2 + 3$ is odd, then n is even.