Check several times, homework may be added as material is covered

**Book problems:** Read sections *The Congruence* $x^2 \equiv a \,(m)$, *Quadratic Residues* and *The Law of Quadratic Residues* in chapter 5, and work through problems 5-11 through 5-13, 5-43 to 5-46.

**Hand in:** page 153: 1, 3, 5, 11, 13

**Other problems:**

**A:** Show that for any odd integer $m$, there is a constant $c_m$ such that

$$\sin mx = c_m \sin x \cdot \sin \left( x + \frac{2\pi}{m} \right) \cdot \sin \left( x + \frac{2\pi \cdot 2}{m} \right) \cdots \sin \left( x + \frac{2\pi(m-1)}{m} \right),$$

and find the constant $c_m$.

**Hints to part A:**

- Use the formula $\sin \theta = \frac{e^{i\theta} - e^{-i\theta}}{2i}$.
- Let $\zeta = e^{\frac{2\pi i}{m}}$. Then show that $t^m - 1 = \prod_{1 \leq j \leq m} (t - \zeta^j)$. Use this formula to simplify the right hand side of the product of sines, where you substituted powers of $\zeta$ for $e^{\frac{2\pi j}{m}}$. 