Problem Set 12
Due: Thursday, April 19

Work all of the following problems. A subset of the problems will be graded. Be sure to adhere to the expectations outlined in the *General Problem Set Guidelines Sheet*.

Unless otherwise stated, all problems can be found in the appropriate *Exercises* sections of the text (*Abstract Algebra* by D. Dummit and R. Foote, 3rd Edition).

- Section 5.1 # 5, 14, 15

- Section 5.2 # 2 part (a), 4 parts (a) and (b), 5

- Let A and B be finite groups and let p be a prime.

  (a) Prove that any Sylow p-subgroup of $A \times B$ is of the form $P \times Q$, where $P \in Syl_p(A)$ and $Q \in Syl_p(B)$.

  (b) Prove that $n_p(A \times B) = n_p(A)n_p(B)$.