Mathematics 120 Midterm Exam II – F. Goodman
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Version 1

Responses will be judged for accuracy, clarity and coherence.

1. Show that if a finite group G acts on a finite set X, then the size of every orbit divides the size of the group.

2. Show that a group of order p^n, where p is a prime, has a non-trivial center.

3. State the structure theorem for finite abelian groups in both the invariant factor form and the elementary divisor form. List all abelian groups of order $216 = 2^3 3^3$; give both the invariant factor decomposition and the elmentary divisor decompositon of each group.

4. Prove Cauchy's theorem (regarding the existence of subgroups of prime order).

5. State the complete Sylow Theorem (all three parts). I don't care about numbering the parts.