

MATH 270
SPRING 2007
EXAM 1

1. (10 pt) Let p be a positive prime integer and $1 \leq n \leq p - 1$. Show that the binomial coefficient $\binom{p}{n}$ is divisible by p .
2. (10 pt) Show that if p is prime and $n \in \mathbb{N}$ then $n^p - n$ is divisible by p .
3. (10 pt) Let R be a relation from the set A to the set B . Show that $(R^{-1} \circ R)^{-1} = R^{-1} \circ R$.
4. (10 pt) Negate the statement "All Kentuckians are cowards or fish have lungs".
5. (10 pt) Show that if A, B, C are sets such that $C = \emptyset$ and $A \cap B = \emptyset$ then

$$|A \cup B \cup C| = |A| + |B|$$