Chris Bendel and Peter Cholak Math 222 Wednesday, February 17

Be sure to carefully write up your answers. It is suggested that you first write out a draft of your proposed questions and then carefully rewrite that draft to get your final version. You do *not* have to write the answers on this sheet of paper.

Find the multiplicative inverse of 56 in $\mathbb{Z}_{61}$.

Prove that if p is a prime and $\alpha, \beta \in \sqrt[p]{1}$ and $\alpha \neq 1$ then there exists an integer m such that $\alpha^m = \beta$. (Hints: First, write $\alpha = \zeta^k$ and $\beta = \zeta^r$ where ζ is the first pth roof of unity. Second, do k and r have multiplicative inverses in $\mathbb{Z}_p$?)

Find the coeffieient of the term $x^{13}y^4$ in $(x+y)^{17}$. Is this number divisible by 17?