MATH 245   Exam 1 Review   Spring

1. Prove by induction that $9^n - 4^n$ is a multiple of 5 for all natural numbers n.

2. Prove by induction that $5^n - 1$ is divisible by 4 for all natural numbers n.

3. Give an example of a relation on $\{1, 2, 3, 4\}$ that is reflexive and symmetric but NOT transitive.

4. Determine if the following relation is an equivalence relation on $\{1, 2, 3, 4, 5\}$. If it is, list the equivalence classes. $\{(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (1, 3), (3, 1)\}$

5. Give an example of a function that is injective but not surjective.

6. Prove that if a and b are not both zero and if there exists an integer c such that $b = ac$, then $a \mid b$.

7. Use the Euclidean Algorithm to find $(143, 451)$. Then solve backwards to find x and y such that $143x + 451y = (143, 451)$.

8. Use the Euclidean Algorithm to find one solution to $7x + 20y = 3$.

9. Find $d(4961)$