Philadelphia University

Department of Basic Sciences

Exam 2 **Number Theory** **03–05–2011**

Solutions must be complete in order to receive full credit.

1. Find a reduced residue system modulo $n = 16$ using only prime numbers.
2. Compute $2^{5200} \% 405$ with the help of Euler's theorem.
3. Evaluate $|7|_{20}$. Is 7 a primitive root modulo 20? Why or why not?
4. Solve the discrete logarithm problem

$$8^x \equiv 15 \pmod{17}$$

   using the primitive root $g = 3$.

5. Let g be an odd number. Prove that if g is a primitive root modulo 11, then g is also a primitive root modulo 22.

–Amin Witno