Math 104A, Practice Midterm 2, Fall 2002.

1(a). Solve $x^2 + 5 \equiv 0 \pmod{49}$.
(b). Solve $x^2 + 5 \equiv 0 \pmod{35}$.

2. (a). Show that if $(m, a)|b$ then the congruence

$$ax \equiv b \pmod{m}$$

has a solution. You may assume any result proved in Chapter 2 of the book, but you must justify any statement concerning congruences.
(b). Find all solutions x modulo 21 to the equation

$$6x \equiv 15 \pmod{21}.$$

3. Show that there are infinitely many primes of the form $4k + 1$.

4. (a). State Euler's Theorem.
(b). Find the smallest positive number ℓ such that for every integer x with $(x, 40) = 1$, we have $x^\ell \equiv 1 \pmod{40}$, and explain your answer.