

**Quiz # 7 for Dr. Z.'s Number Theory**

**NAME:** (print!) \_\_\_\_\_

**E-MAIL ADDRESS:** (print!) \_\_\_\_\_

**1.** (3 points) Using the formula, find  $\phi(3003)$ .

**2.** (3 points) State and prove Euler's Classical Formula for the sum-over-divisors of  $n$  of  $\phi$ .

**3.** (4 points) For the following prime  $p$  and  $q$  (let  $n = pq$ ) public key  $e$ , and encrypted message  $c$

(i) Check that  $e$  is an OK key, i.e. that it is coprime to  $\phi(n)$ .

(ii) Find the deciphering key,  $d$ , such that  $de \equiv 1 \pmod{\phi(n)}$

(iii) Suppose Alice sent you the encrypted message  $c$ . Check that this is an OK message (coprime to  $n$ ), and if it is find her original message?,  $m$

$$p = 3 \quad , \quad q = 5 \quad , \quad e = 5 \quad , \quad c = 7$$