QUIZ 3

(Math 258)

1. Show that if a, b, c and d are integers such that $a|c$ and $b|d$, then $ab|cd$. (3 pts)

2. Show that if $2^n - 1$ is prime, then n is prime. (3 pts)
   (*Hint*: Use the identity $2^{ab} - 1 = (2^a - 1)(2^{a(b-1)} + 2^{a(b-2)} + \ldots + 2^a + 1)$)

3. (a) Encrypt the message "MATH IS FUN" by translating the letters into numbers, applying the encryption function given below, and then translating the numbers back into letters. The function is: $f(x) = (p+13) \bmod 26$. (6 pts)

   (b) Decrypt the encrypted message below, using the Caesar cipher:

   WHVW WRGDB

4. Find the gcd(111, 201) using the Euclidean algorithm. (4 pts)

5. Which of the following have an inverse and why: (a) 3 in Z_6, (b) 4 in Z_5. (4 pts)
Find the inverse for the case that the inverse exists.