**CS441 – Discrete Structures for Computer Science**
**Instructor:** Dr.Litman

## Problem from Section 3.4

6.

Under the hypotheses, we have *c=as* and *d = bt* for some *s* and *t*. Multiplying, we obtain *cd = ab(st)*, which means that *ab | cd* as desired.

10.

a) 44 div 8 =5, 44 mod 8 = 4
b) 777 div 21 = 37 , 777 mod 21 = 0
c) -123 div 19 = -7, -123 mod 19 = 10
d) –1 div 23 = -1, -1 mod 23 = 22
e) –2002 div 87 = -24, -2002 mod 87 = 86
f) 0 div 17 = 0, 0 mod 17 = 0
g) 1234567 div 1001 = 1233, 1234567 mod 1001 = 334
h) –100 div 101 = -1, -100 mod 101 = 1

12.

Assume that a $\equiv$ b(mod m). This means that m | (b-a), say a-b = mc, so that a = b+mc. Now let us compute a mod m. We know that b = qm +r for some nonnegative r less than m (namely, r = b mod m). Therefore we can write a = qm+r+mc = (q+c)m+r. By definition this means that r must also equal a mod m. That is what we wanted to prove.

16.

a) –17 mod 2 = 1
b) 144 mod 7 = 4
c) –101 mod 13 = 3
d) 199 mod 19 = 9

32.

We need to subtract 3 from each letter. For example E goes down to B and B goes down to Y.

a) BLUE JEANS
b) TEST TODAY
c) EAT DIM SUM

## Problem from Section 3.5

2.

The numbers 19, 101, 107, 113 are prime, as we can verify using trial division. 27 and 93=31*3 are not prime.

4.

By trial division: 39=3*13, 81 = $3^4$, 101 is prime, 143 = 11 * 13, 289 = $17^2$, 899 = 29 * 31