

**ÇANKAYA UNIVERSITY**  
Department of Mathematics and Computer Science

**MATH 365**  
**Elementary Number Theory I**  
First Midterm Practice Exam (C)

November 12, 2007  
16:40 – 18:00

Find the  $(a, b)$  for each pair given in problems 1 through 8. Then solve the equations backward to find  $x$  and  $y$  such that  $ax + by = (a, b)$ .

1.  $a = 217, b = 341$
2.  $a = 117, b = 247$
3.  $a = 143, b = 451$
4.  $a = 165, b = 465$
5.  $a = 89, b = 55$
6.  $a = 123, b = 76$
7.  $a = -899, b = 2030$
8.  $a = -4050, b = -1728$
9. Find  $x$  and  $y$  such that  $26x + 14y = (26, 14)$  with  $x$  positive but as small as possible.
10. Find  $x$  and  $y$  such that  $27x + 15y = (27, 15)$  with  $x$  positive but as small as possible.
11. Use problem 1 to solve  $217x + 341y = 62$ .
12. Use problem 2 to solve  $117x + 247y = 39$ .
13. Find all solutions to  $2x + 3y = 50$  in positive integers.
14. Find all solutions to  $3x + 4y = 60$  in positive integers.
15. Find all solutions to  $4x + 6y = 60$  in positive integers.
16. Find all solutions to  $6x + 9y = 91$  in positive integers.
17. Why is  $4x + 6y = 25$  unsolvable?

18. Why is  $361x + 2109y = 1000$  unsolvable?
19. Determine all integers  $x$  such that  $2x + 3y = 1$  is solvable.
20. Determine all integers  $x$  such that  $3x + 2y = 4$  is solvable.