Problem Solving
Set 21

24 July 2012

1. (a) A sequence $x_1, x_2, \ldots$ of real numbers satises

$$x_{n+1} = x_n \cos x_n$$

for all $n \geq 1$. Does it follow that this sequence converges for all initial values x_1?

   (b) A sequence $y_1, y_2, \ldots$ of real numbers satises

$$y_{n+1} = y_n \sin y_n$$

for all $n \geq 1$. Does it follow that this sequence converges for all initial values y_1?

2. Show that in any collection of 52 distinct positive integers there are two distinct numbers whose sum or difference is divisible by 100.