

# General Mathematics and CPS II

## Exercise 11

March 19, 2014

1. Newton's second law of mechanics for a particle of mass  $m$  situated at position  $x(t)$  moving with velocity  $v(t)$  and subject to a force  $F(x(t))$  can be written

$$\begin{aligned}\frac{dx}{dt} &= v, \\ m \frac{dv}{dt} &= F(x(t)).\end{aligned}$$

Use the chain rule of calculus to show that the particle satisfies the same equation with  $t$  replaced by the reversed time  $r = -t$  and  $v$  replaced by  $-v$ .

2. Show that in a time-discrete, reversible, system with a finite number of states any orbit must return to its initial state after a finite number of steps.