# Ph1105 Problem Sheet F

**1.** Solve the following initial-value problems

(i) $x dy/dx + 4y = 0$,

$y(1) = 2$

(ii) $dy/dx - (\tan x)y = 0$,

$y(0) = 1$.

**2.** Suppose that an initial population of 1000 bacteria grows exponentially at the rate of 5 per cent per minute and that $y = y(t)$ is the number of bacteria present $t$ minutes later.

(i) Find an initial-value problem whose solution is $y(t)$

(ii) Solve for $y(t)$

(iii) How long does it take for the population to double?

(iv) How long does it take for the population to reach 20000?

**3.** In a certain culture of bacteria the number of bacteria increased fivefold in 20 minutes. How long did it take the population to double, assuming that the growth rate is approximated by a continuous exponential growth model.