7. (a) The cellphone subscription among the Indian middle class is growing partly because of external stimuli (price, quality, connectivity, services etc) represented by the function $s(t)$ and partly because of a human tendency to imitate others, represented by the *Imitation Coefficient* I. As such, the growth rate of population fraction $y(t)$ using (owning) cellphones is given by

$$y' = (1 - y)[s(t) + Iy].$$

Using one obvious solution, i.e. in which the entire population uses cellphones, reduce this Riccati equation to a Bernoulli's equation and solve the equation (up to a quadrature).

(b) For our simulation, we decide to use the model of the *stimulus function* as $s(t) = a + bt + ct^2$, accounting for the present services, infrastructure development and mushrooming growth of private providers. With this model and the rough quantification of the socio-economic situation through the assumptions that

i. imitating tendency of the Indian middle class is 5%,

ii. currently, among the new initiates in cellphone usage, imitation and stimuli are roughly equally strong factors,

iii. the external facilitating factors are likely to grow by 20% in the next one year, in which the linear and quadratic factors are likely to play almost equal roles;

use a numerical integration routine to predict the fraction of cellphone users among the middle class after five years, if right now the users are only 20%.