CS-201

Computational Physics

Lab-5

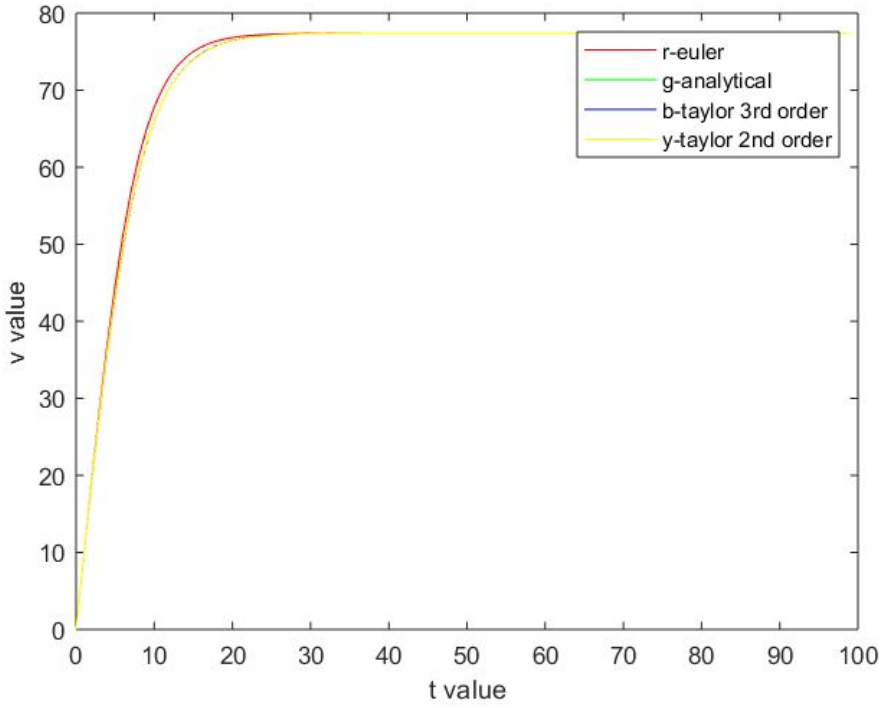
28 . 02 . 2020

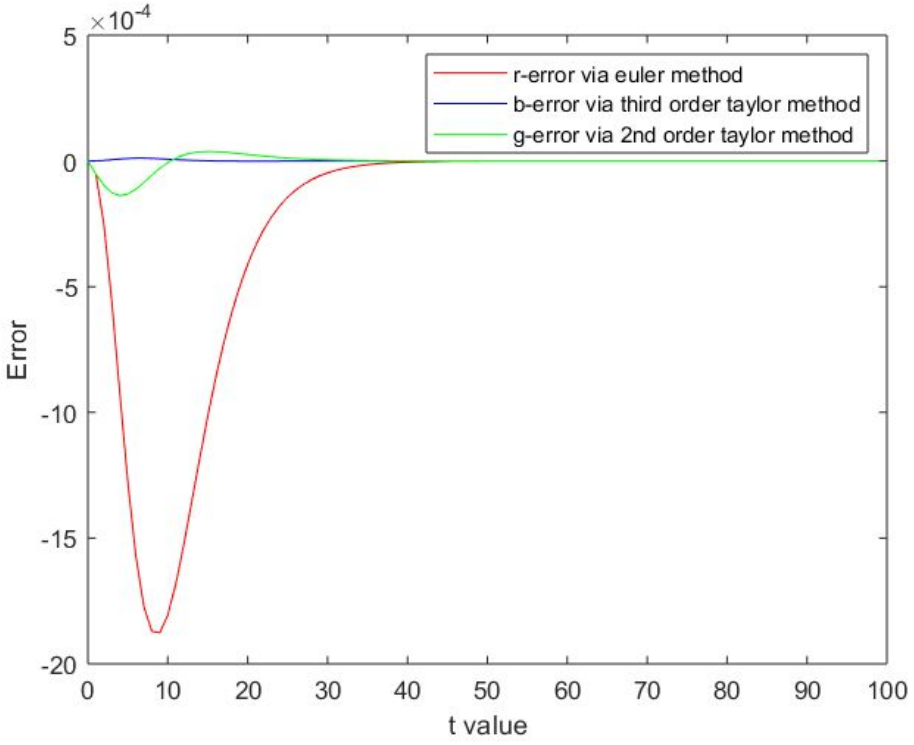
Arkaprabha Banerjee 201801408
Shantanu Tyagi 201801015

5 Air Resistance

5.1 *f(v) = g - k/m * v^2 ; v(0) = 0 m/s ; $0 \leq t \leq 100$, $\Delta t = 0.001$*

Analytical Solution : *v = √(mg/k) tanh (√(gk/m)* ***t****)*



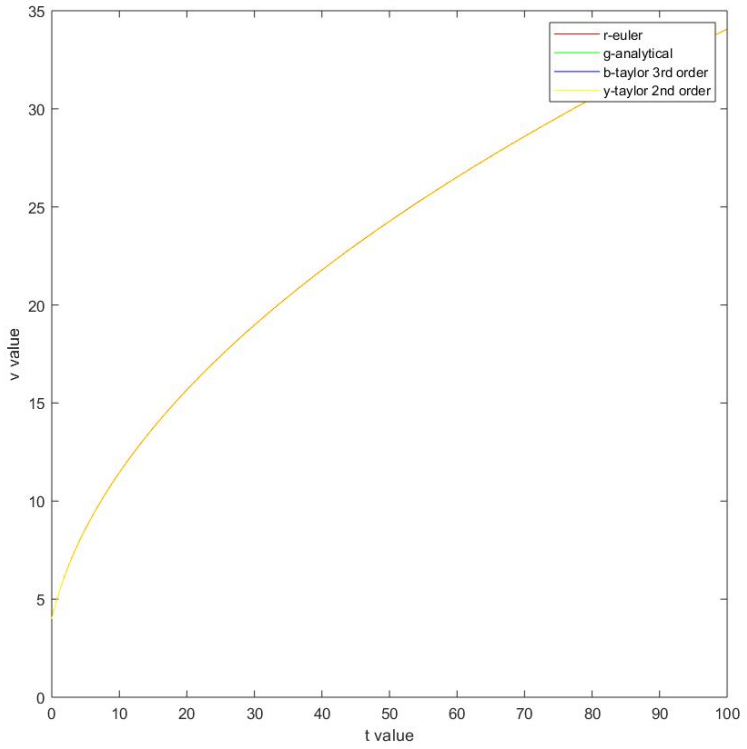


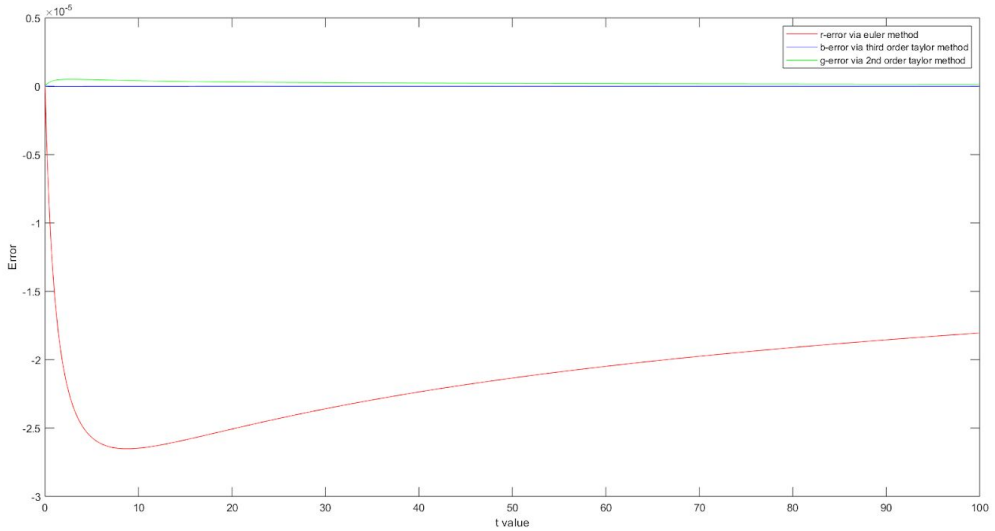
5.2.a Ignoring Air Drag :

f(v) = P/mv ; v(0) = 4m/s ; $0 \leq t \leq 10$, $\Delta t = 0.001$

P = 400 W , m = 70kg

Analytical Solution : $v^2 = v_0^2 + 2Pt/m$

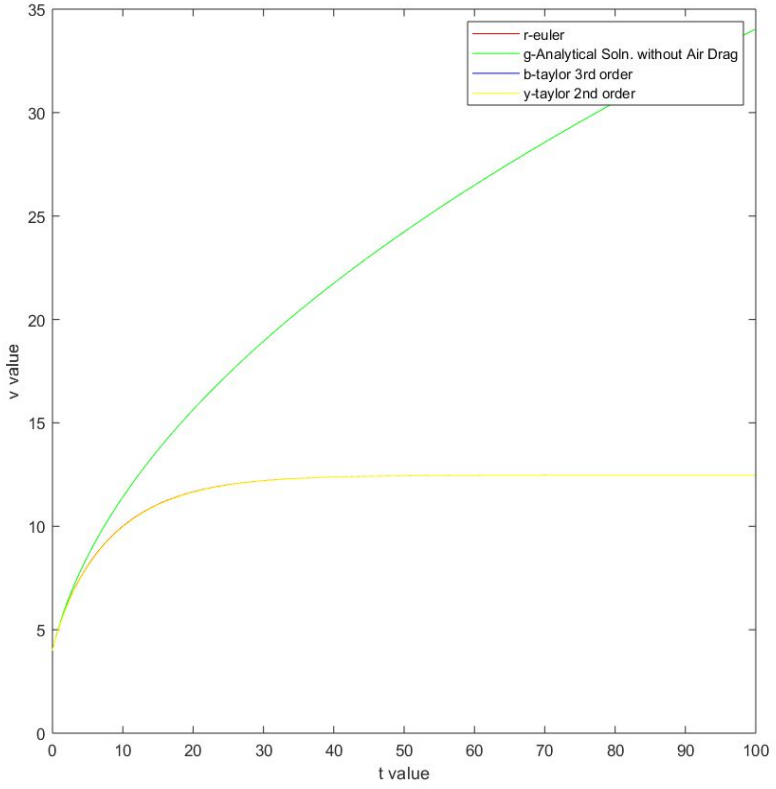




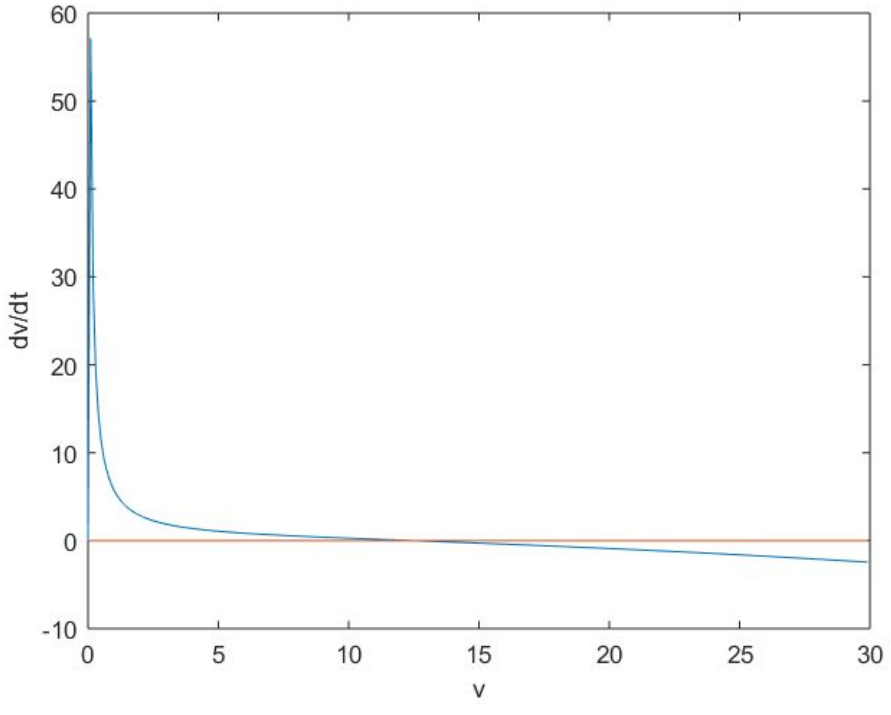
5.2.b With Air Drag :

$f(v) = (P - b\rho Av^3)/mv$; $v(0) = 4m/s$; $0 \leq t \leq 100$, $\Delta t = 0.001$

$B = 0.5$; $A = 0.33\ m^2$; $\rho = 1.25\ kgm^{-3}$



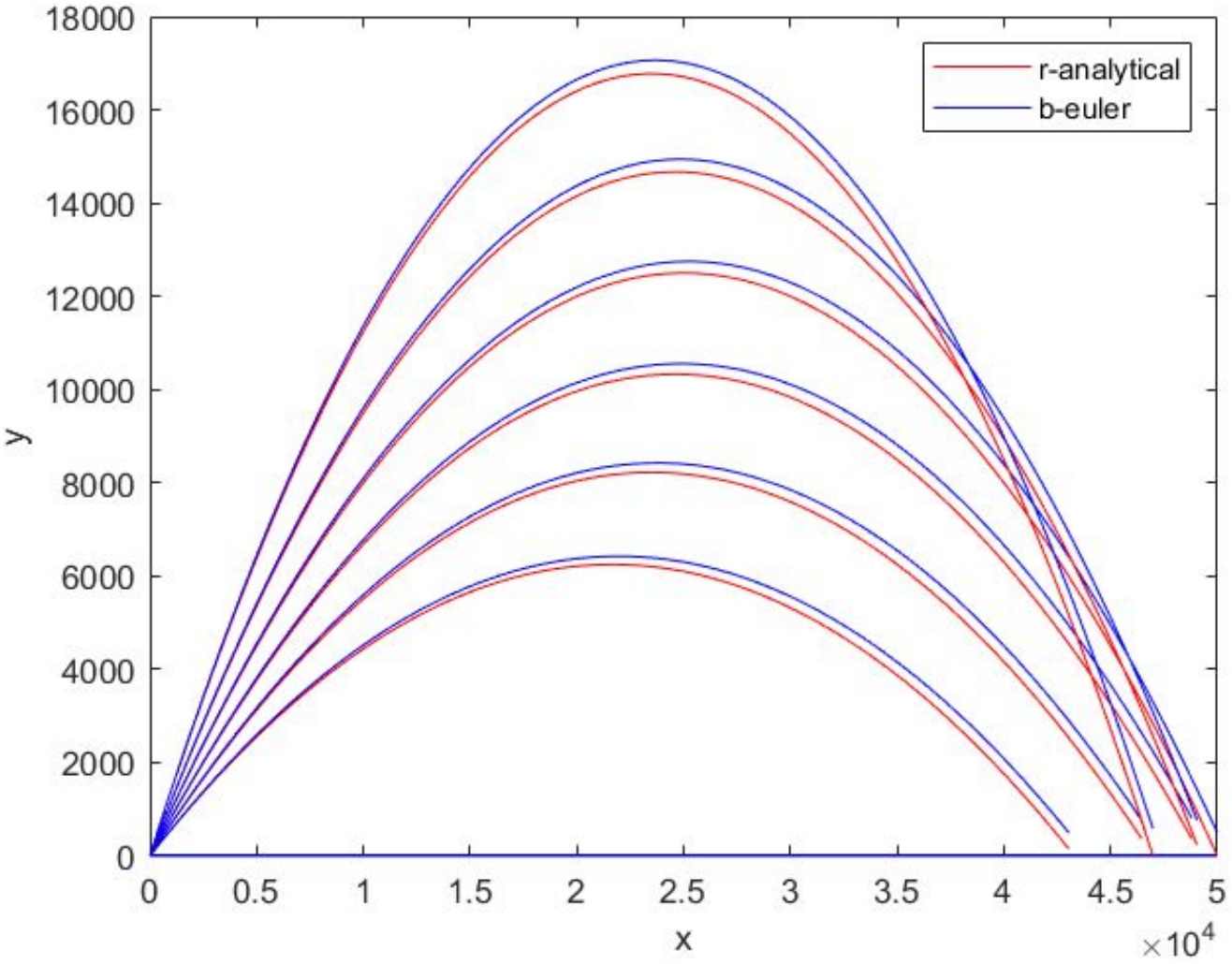
5.2.c dv/dt - v plot



5.3.a $y = x\tan\theta) - gx^2/2*(v\cos\theta))^2$;$v = 700$ m/s; $B/m = 4 \times 10^{-5}$ kg/m

$x(0)=0, y(0)=0, vx(0)=v*\sin(\theta), vy(0)=v*\cos(\theta);$ $0 \leq t \leq T, \Delta t = 1$

Values of θ (without air drag) = 30, 35, 40, 45, 50, 55 (in degrees)



5.3.b *With air drag, the graph of corresponding Euler approximations for same values of θ i.e. 30, 35, 40, 45, 50, 55 (in degrees)*