CS-201

Computational Physics

Lab-3

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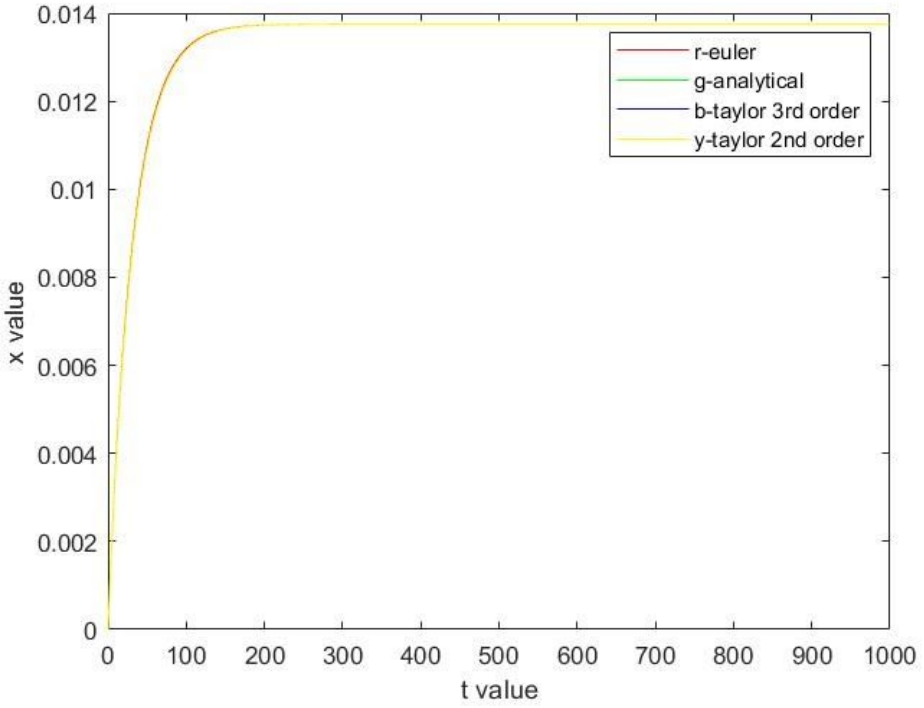
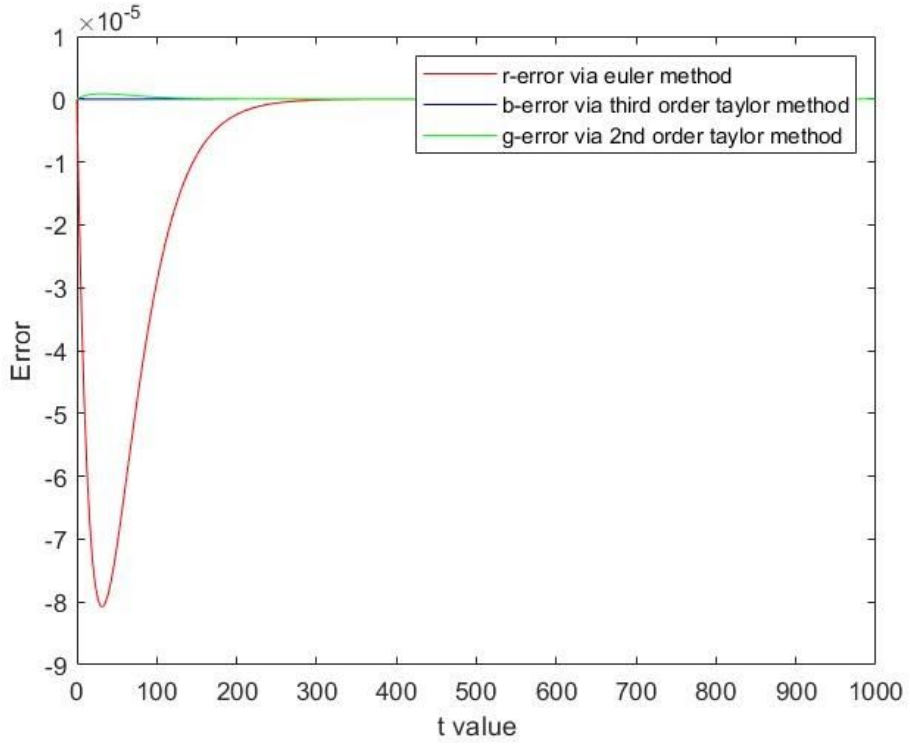
3 Growth and it's Saturation

3.1 $f(x) = 4.332*10^{-4} - 0.0315 * x \quad ; \quad x(0) = 0 \quad ; \quad 0 \leq t \leq 1000 \quad , \quad \Delta t = 1$

$\boldsymbol{r} = 4.332*10^{-4} \quad , \quad \boldsymbol{\lambda} = 0.0315$

Analytical solution : $x(t) = 0.01375*(1 - e^{-0.0315 * t})$

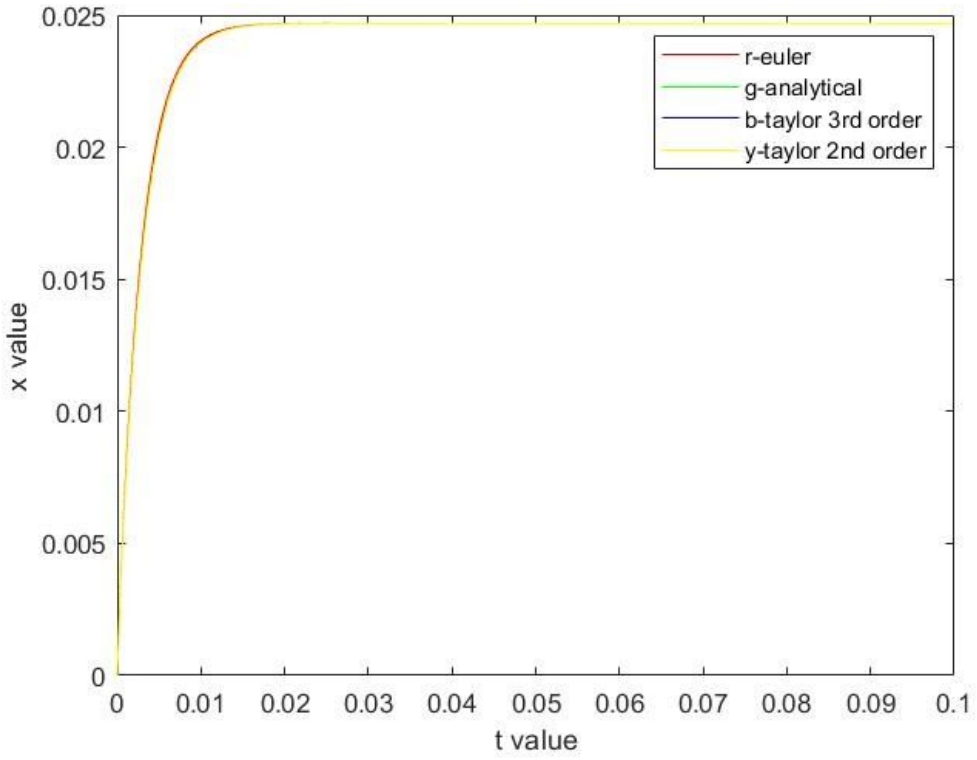


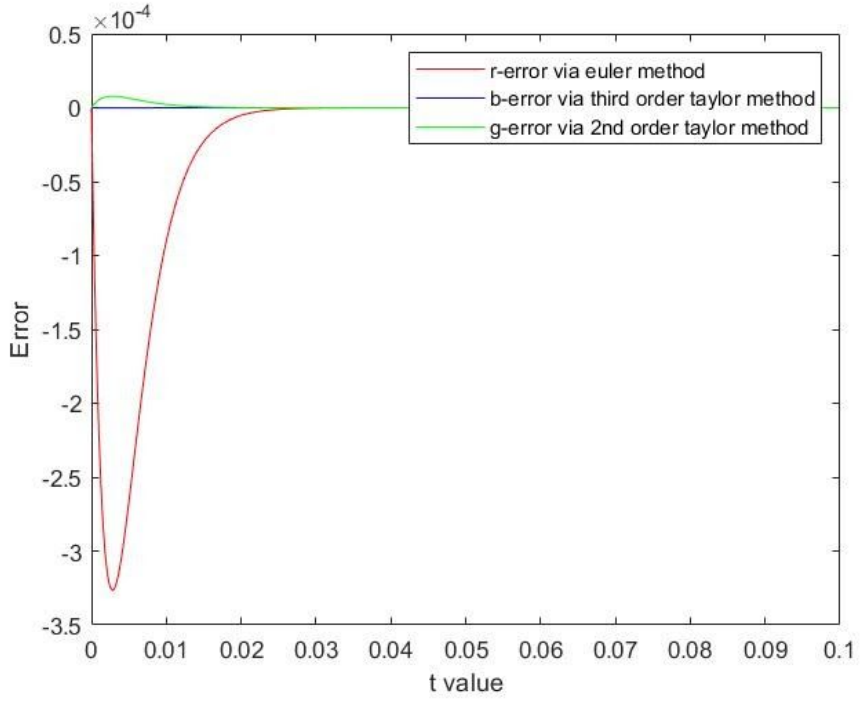


3.2 *f(v) = 8.6189 - 349.038 * x ; v(0)=0 ; $0 \leq t \leq 0.01$, $\Delta t = 2 * 10^{-4}$*

***A** = 8.6189 , **B**=349.038*

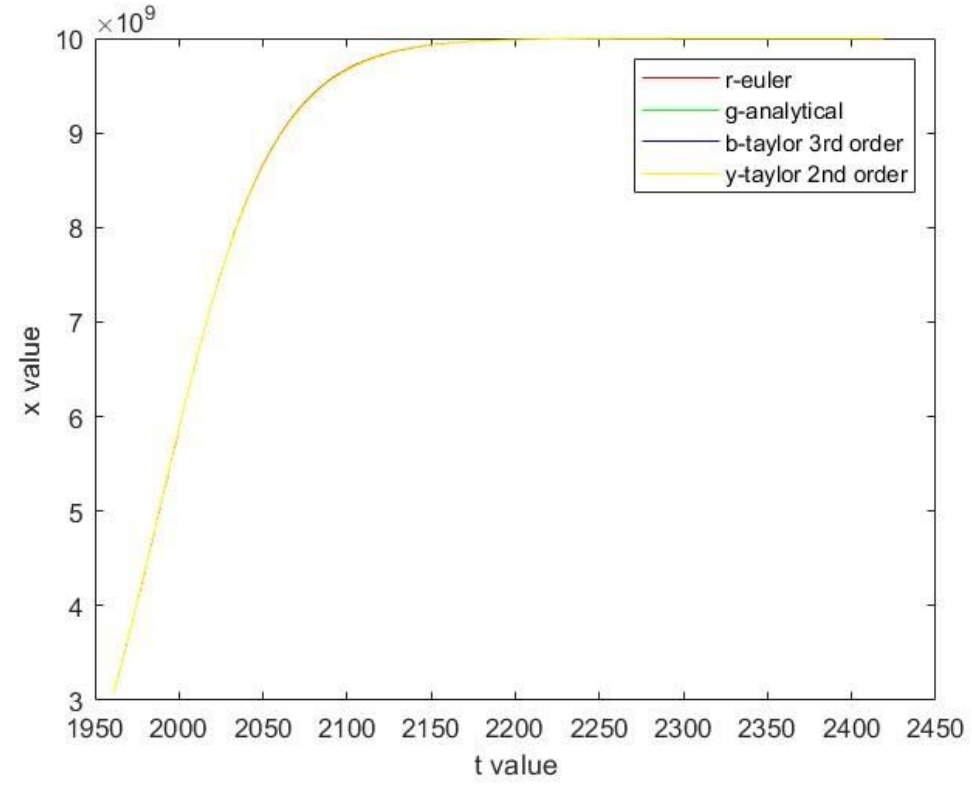
Analytical Solution : $v(t) = 2.469 * 10^{-2} * e^{-349.038*t}$

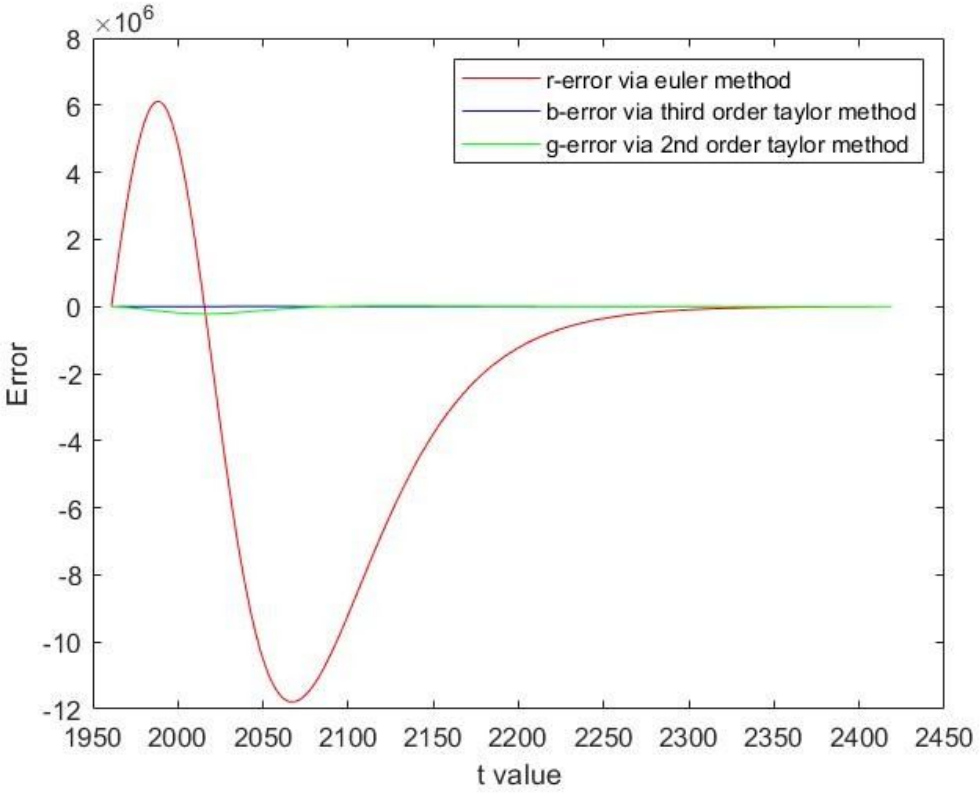




3.3 $f(x) = 0.03 * x - 3 * 10^{-12} * x^2$; $x(1961) = 3 * 10^9$; $1961 \leq t \leq 2500$, $\Delta t = 1$

Analytical Solution : $x(t) = (3.07 * 10^9 * e^{0.03 * (t - 1961)}) / (1 + 0.307 * (e^{0.03 * (t - 1961)} - 1))$





Limiting Population = 10^{10}
Current Population (Via Analytical Equation) = $7.1623 * 10^9$
Current Population (Via Euler Approximation) = $7.1636 * 10^9$
Current Population (Via Taylor 2^{nd} Order Approximation) = $7.1625 * 10^9$
Current Population (Via Taylor 3^{rd} Order Approximation) = $7.1623 * 10^9$
Current Population (Actual) = $7.7642 * 10^9$