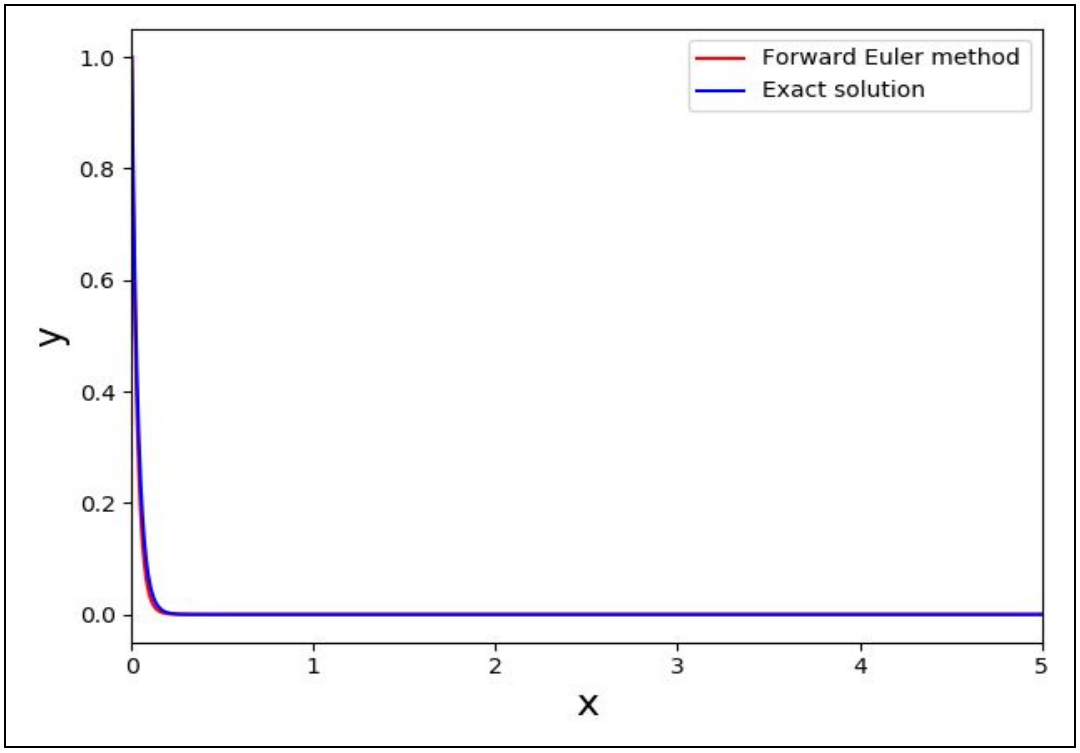
Assignment -1 Report

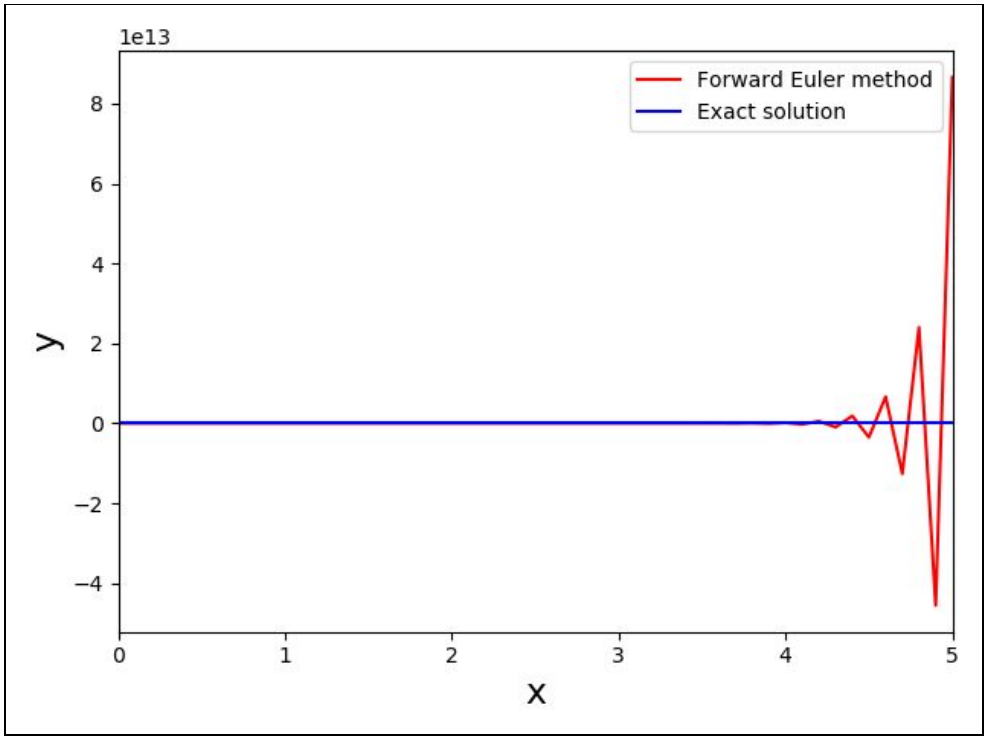
6th August 2019 || HARSH KUMAR (2016MT10629)

EULER METHOD

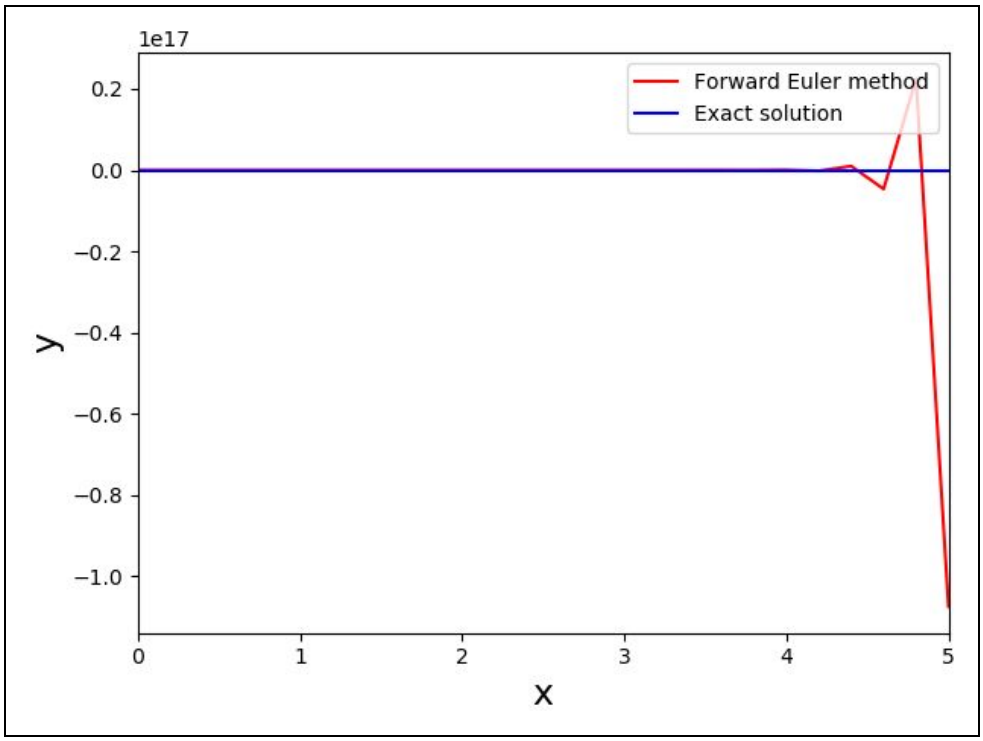
1. **Step Size = 0.01 ; Interval = (0,5) ; Y(0) =1: Maximum difference = 0.06104054924763902**



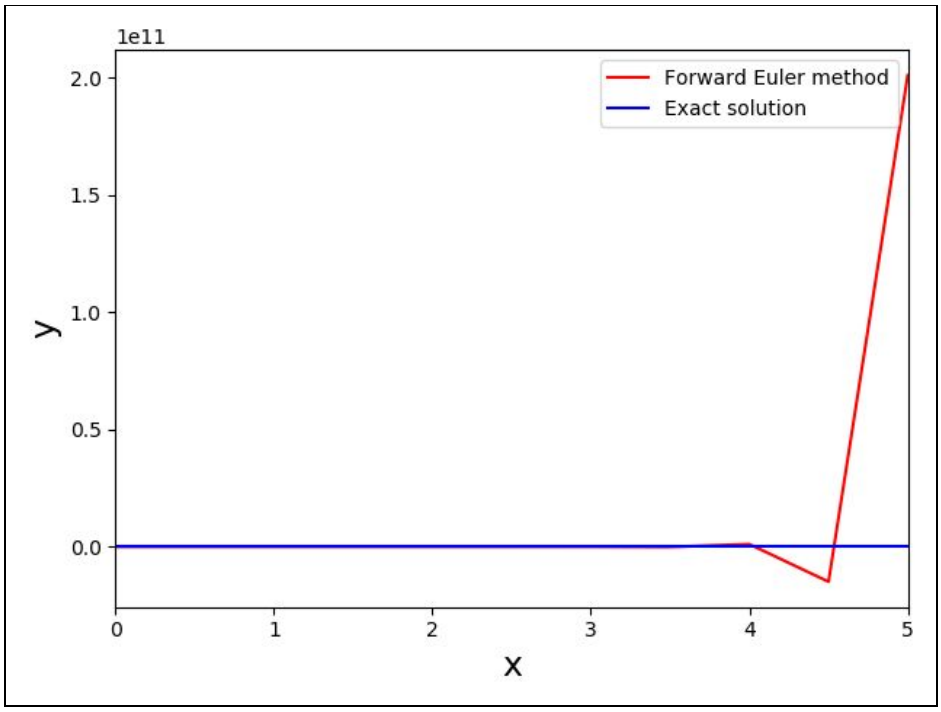
2. **Step Size = 0.1 ; Interval = (0,5) ; Y(0) =1 ;** Maximum difference = 86632340496059.94



3. **Step Size = 0.2 ; Interval = (0,5) ; Y(0) =1;** Maximum difference = 1.07406591432e+17

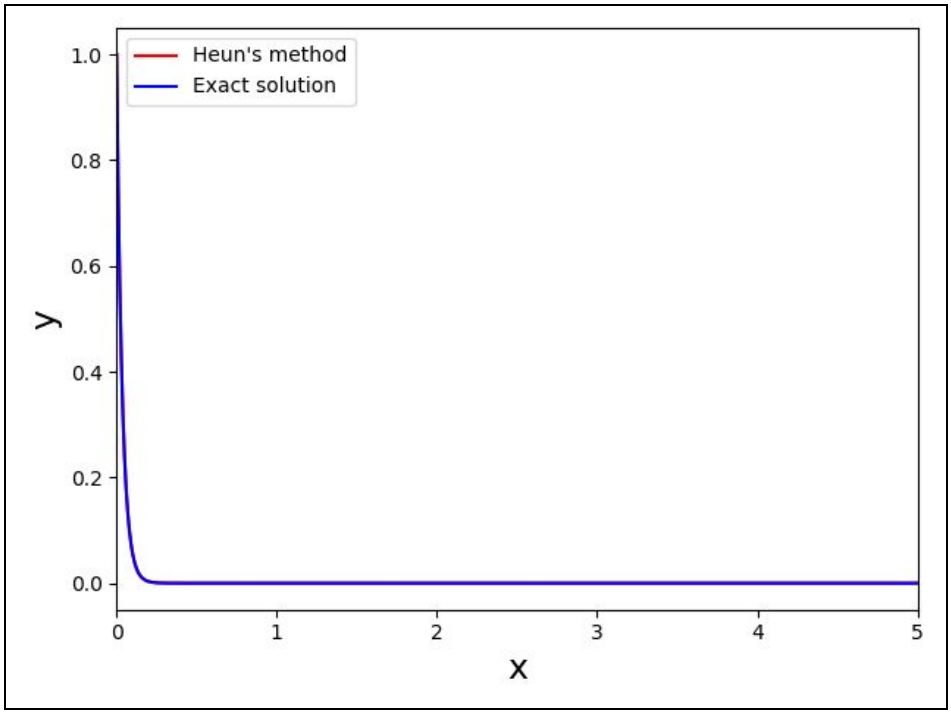


4. **Step Size = 0.5 ; Interval = (0,5) ; Y(0) =1 ; Maximum difference = 201065558686.18**

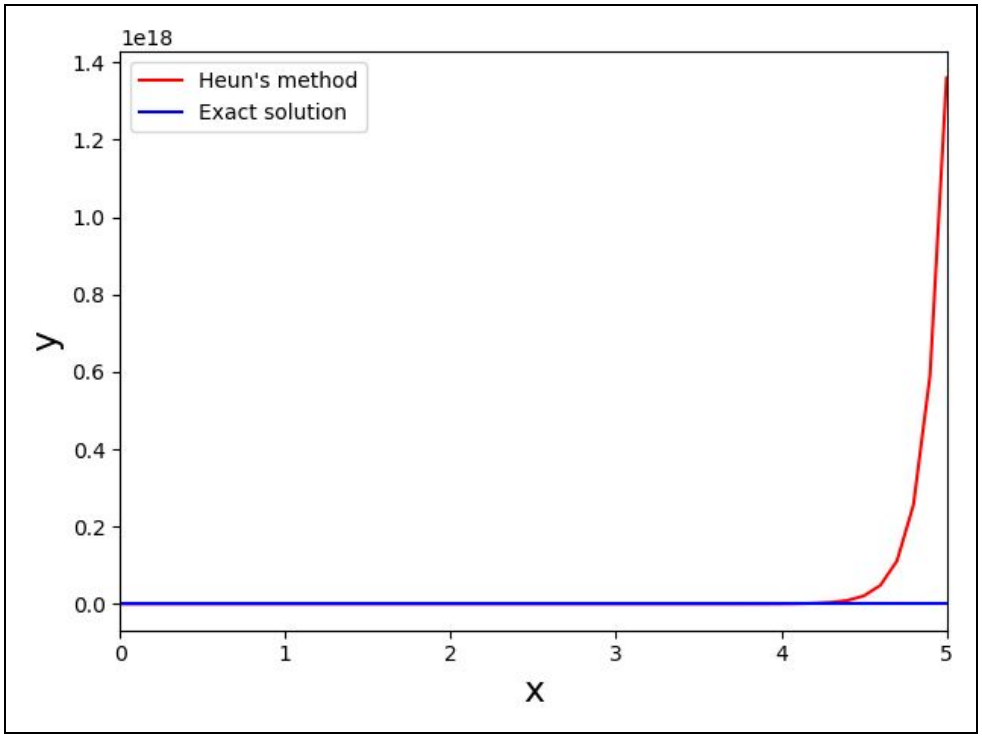


IMPROVED EULER METHOD

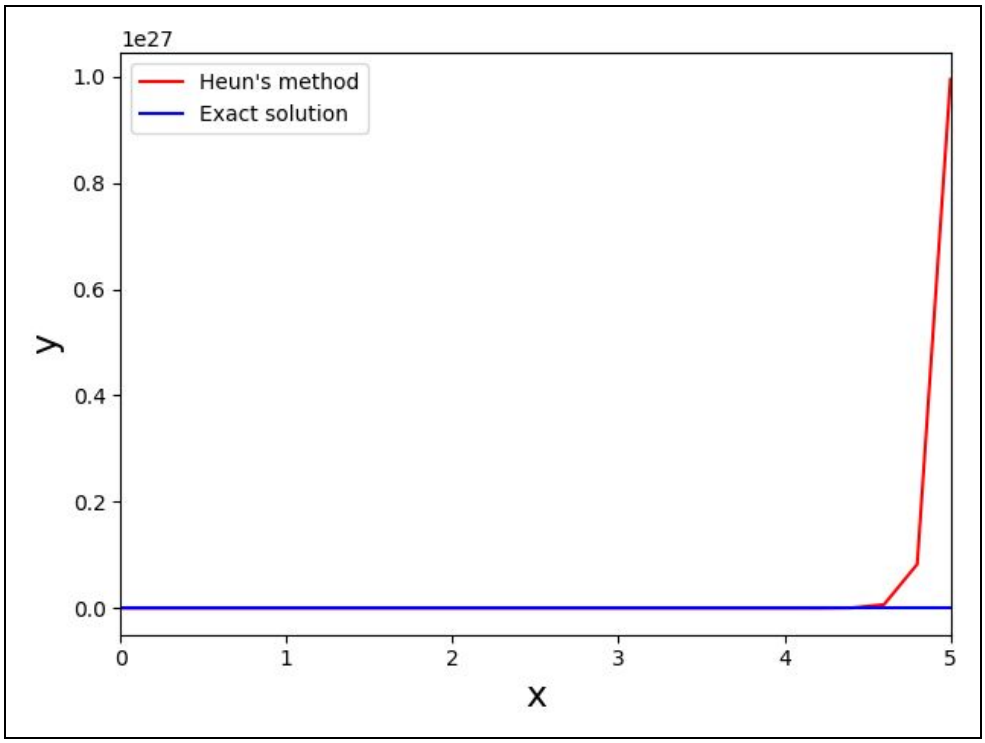
5. **Step Size = 0.01 ; Interval = (0,5) ; Y(0) =1 ; Maximum difference = 0.0063936534179**



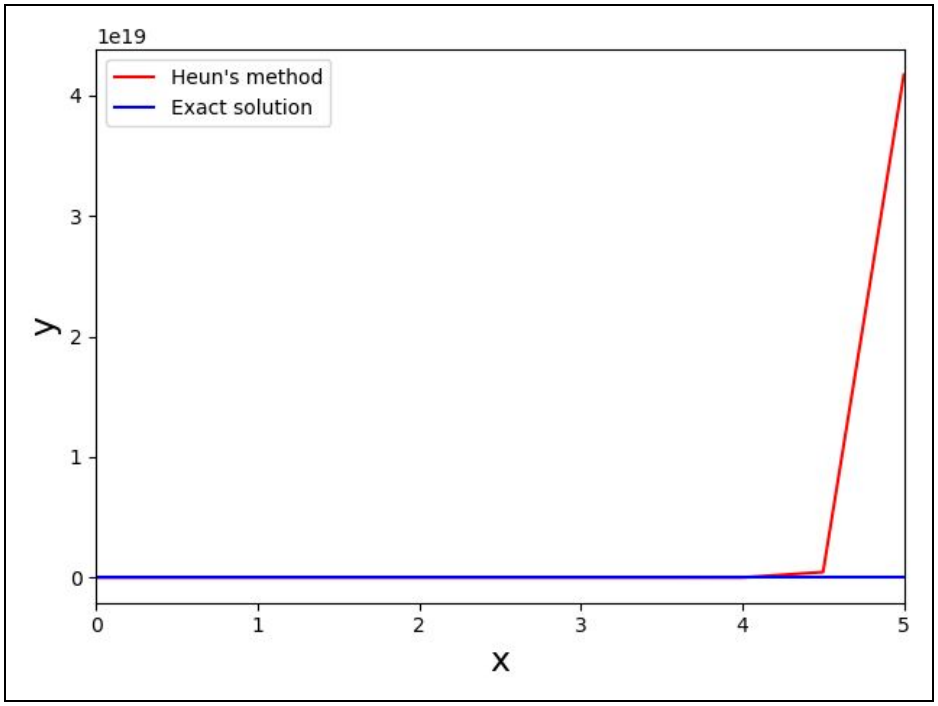
6. **Step Size = 0.1 ; Interval = (0,5) ; Y(0) =1 ; Maximum difference = 1.3600237305e+18**



7. **Step Size = 0.2 ; Interval = (0,5) ; Y(0) =1; Maximum difference = 9.9451581021e+26**

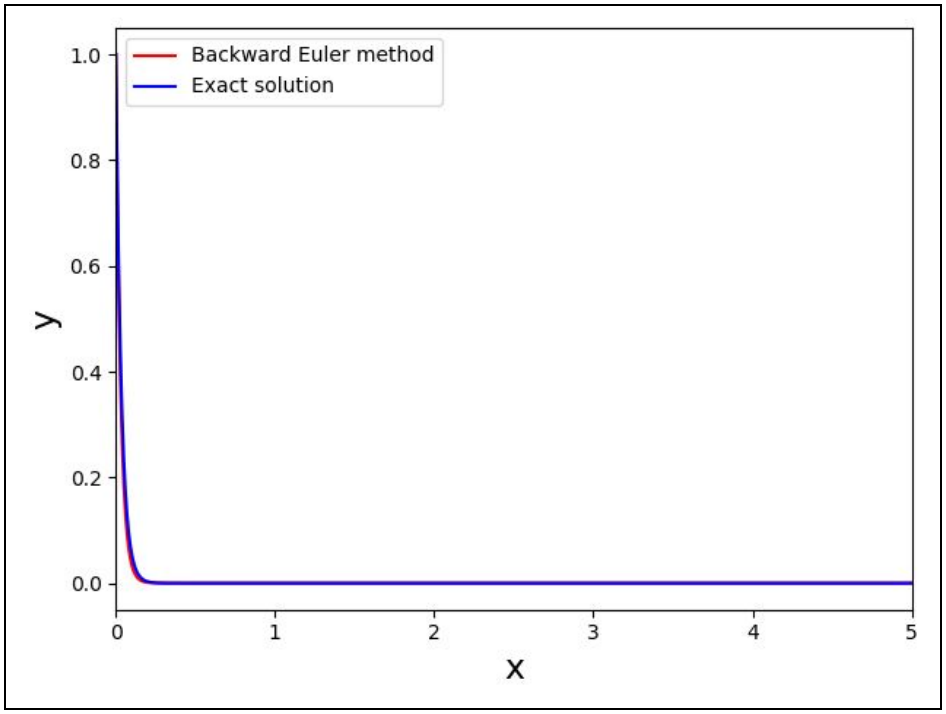


8. **Step Size = 0.5 ; Interval = (0,5) ; Y(0) =1 ; Maximum difference = 4.1700366935e+19**

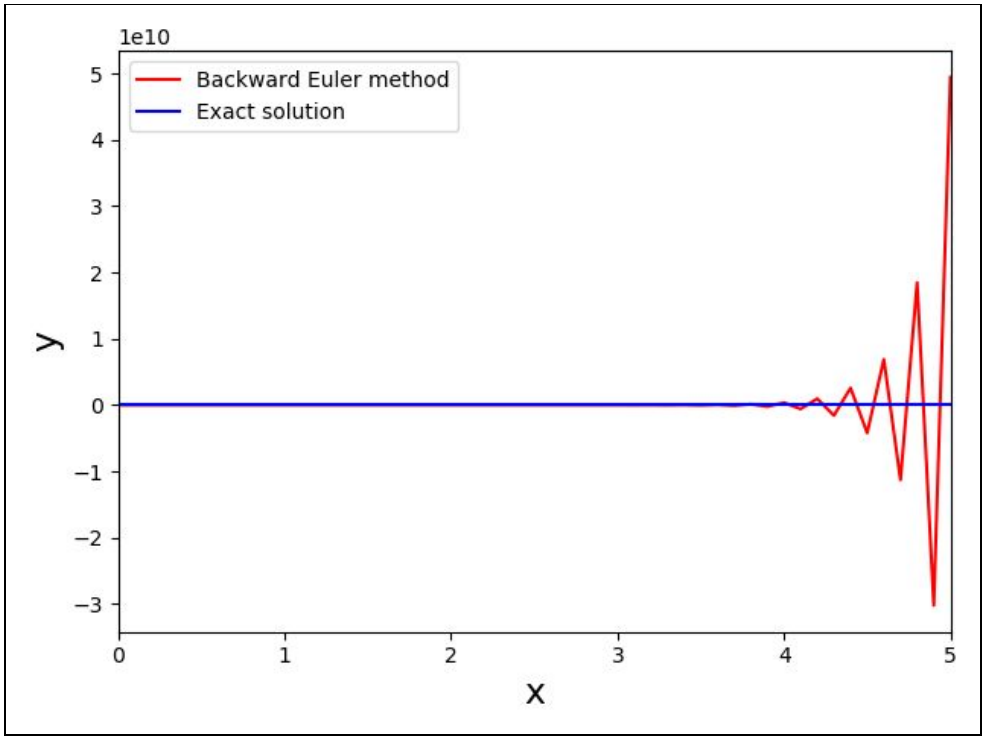


BACKWARD EULER METHOD

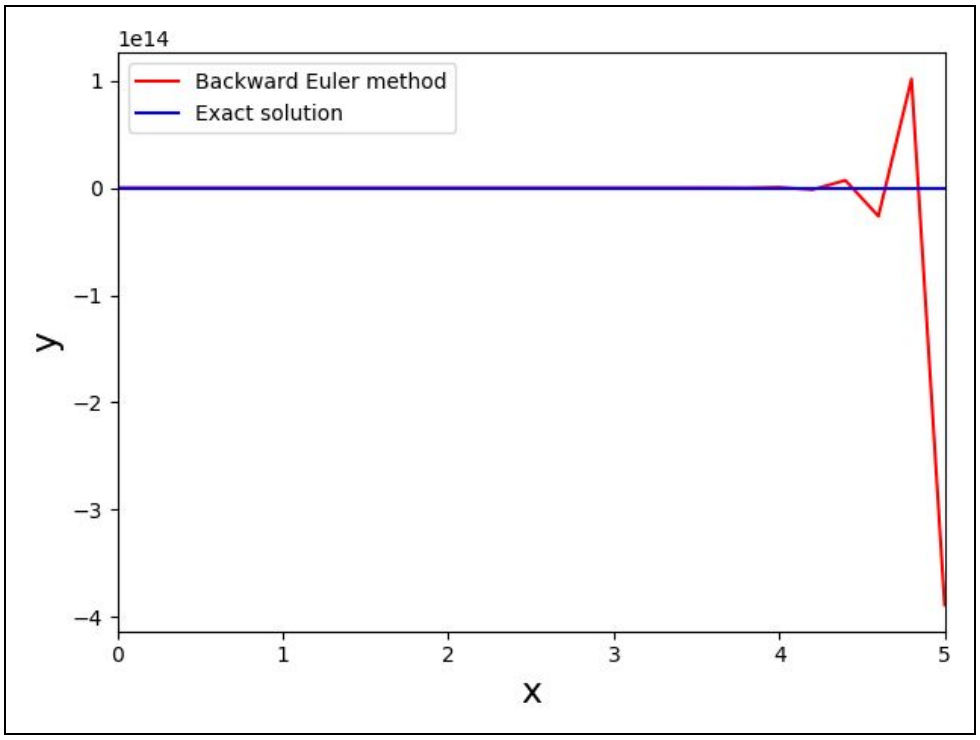
9. **Step Size = 0.01 ; Interval = (0,5) ; Y(0) =1 ; Maximum difference = 0.0566807177139**



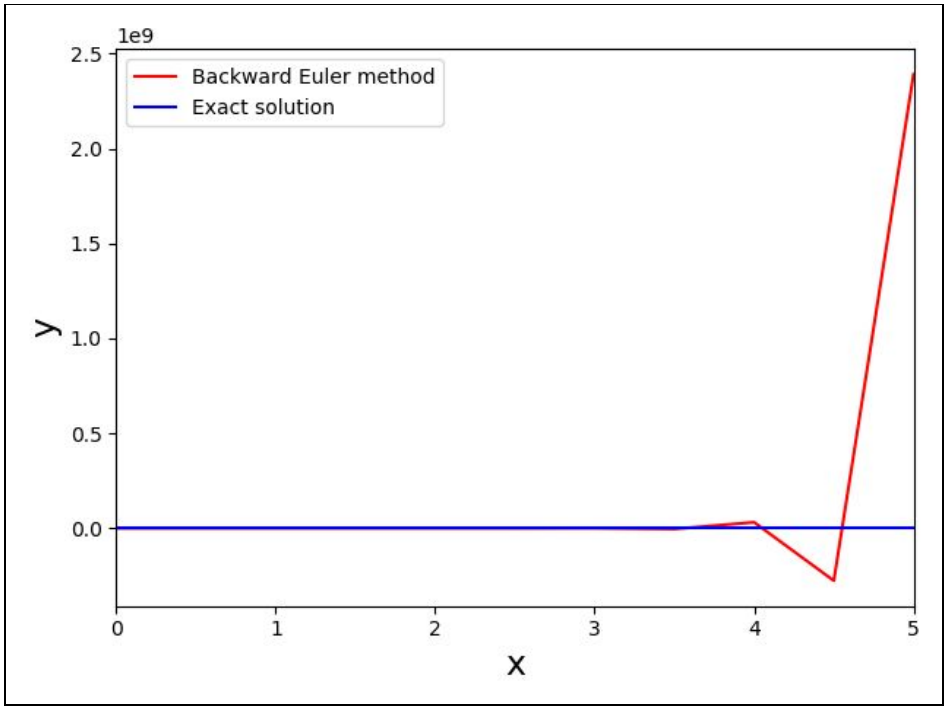
10. Step Size = 0.1 ; Interval = (0,5) ; Y(0) =1 ; Maximum difference = 49430044023.584



11. Step Size = 0.2 ; Interval = (0,5) ; Y(0) =1 ; Maximum difference = 388521127900331

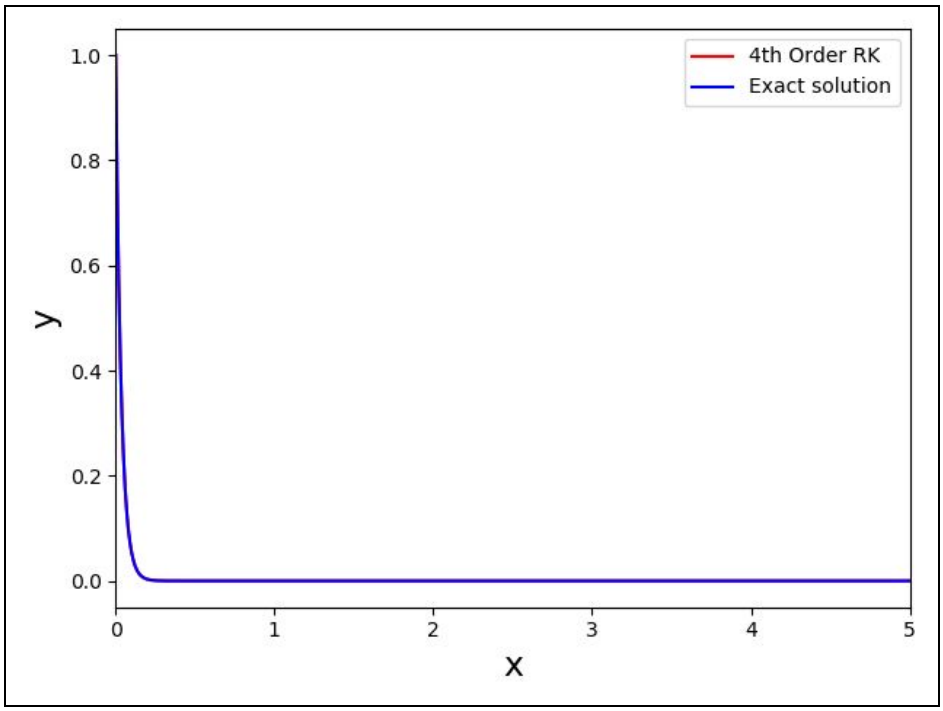


12. Step Size = 0.5 ; Interval = (0,5) ; Y(0) =1 ; Maximum difference = 2390677160.55099

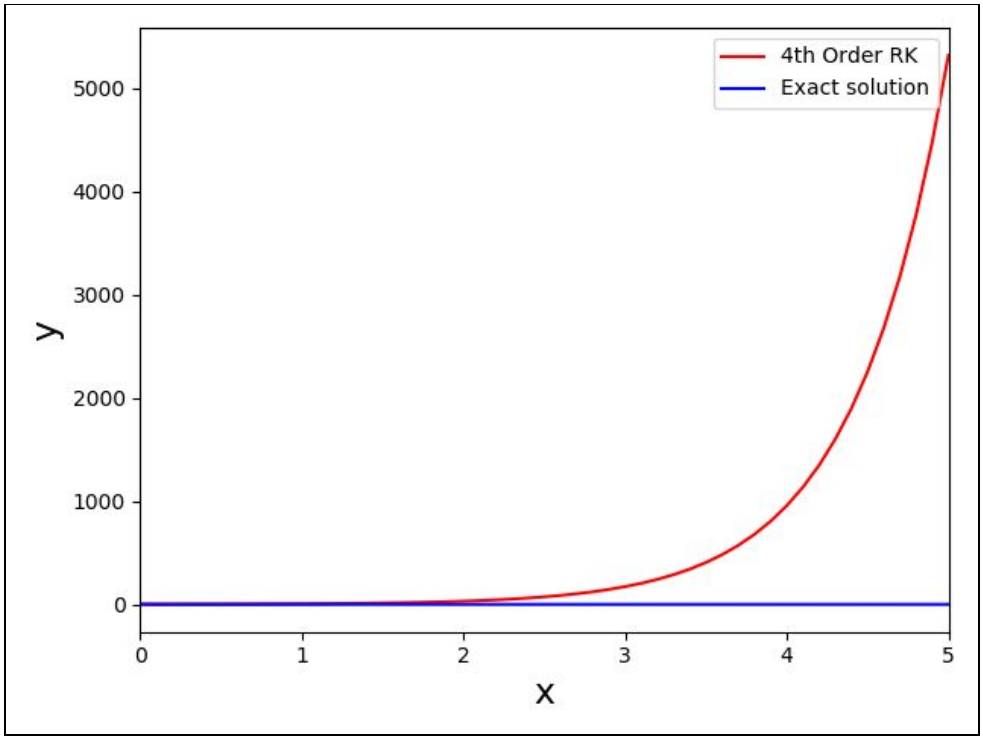


RK -4 METHOD

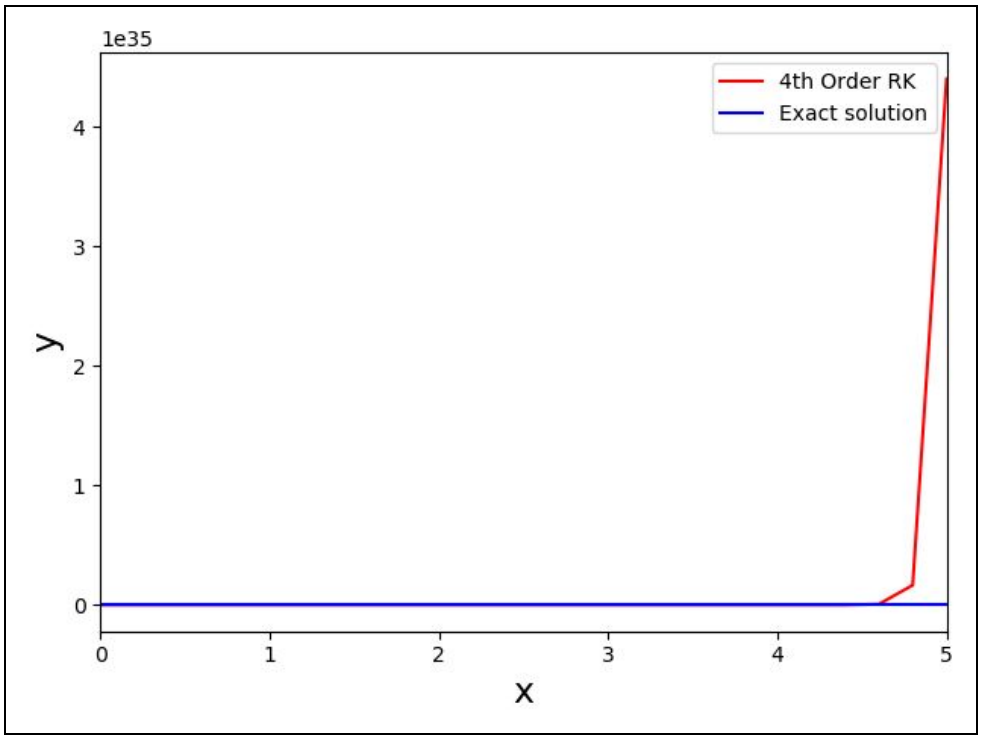
13. **Step Size = 0.01 ; Interval = (0,5) ; Y(0) =1 ; Maximum difference = 2.737879467e-05**



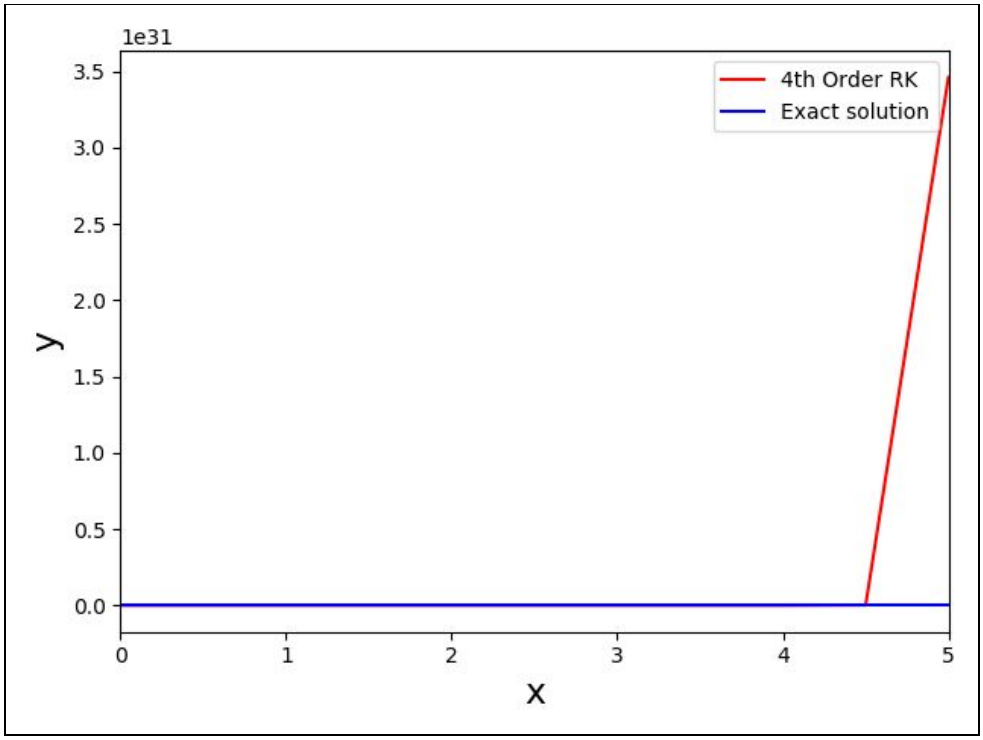
14. Step Size = 0.1 ; Interval = (0,5) ; Y(0) =1 ; Maximum difference = 5316.9296164233



15. Step Size = 0.2 ; Interval = (0,5) ; Y(0) =1 ; Maximum difference = 4.4036766774e+35



16. Step Size = 0.5 ; Interval = (0,5) ; Y(0) =1 ; Maximum difference = 3.4622847586e+31



CONCLUSION

TABLE FOR MAX DIFFERENCE ERROR :

Method\ Step Size	h= 0.01	h= 0.1	h=0.2	h=0.5
Euler Method	0.06104054924763902	86632340496059.94	1.07406591432e+17	201065558686.18
Backward Euler Method	0.0566807177139	17. 49430044023.584	38852112790033 1	2390677160.55099
Heun Method	0.0063936534179	1.3600237305e+18	9.9451581021e+26	4.1700366935e+19
RK- 04 Method	2.737879467e-05	5316.9296164233	4.4036766774e+35	3.4622847586e+31

After Testing for different value of step size, Its is Observed that Euler and Backward Euler method both show oscillation for step size > 0.1 , Which is theoretically true because for [h>2/29] these methods diverge. RK Method have been better choice for smaller value of step size, But for large values it diverges more steeply.