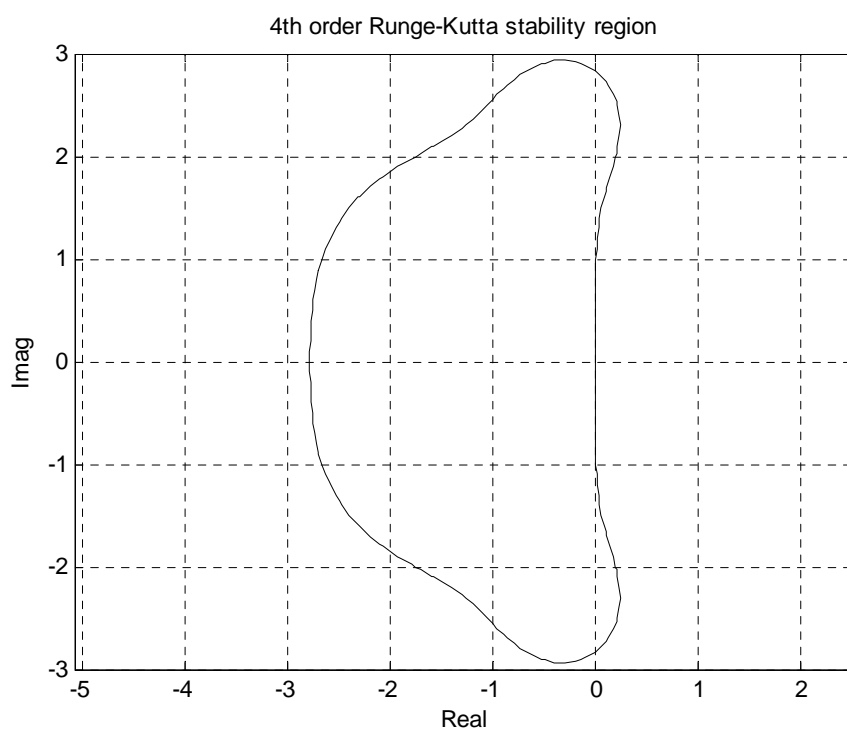
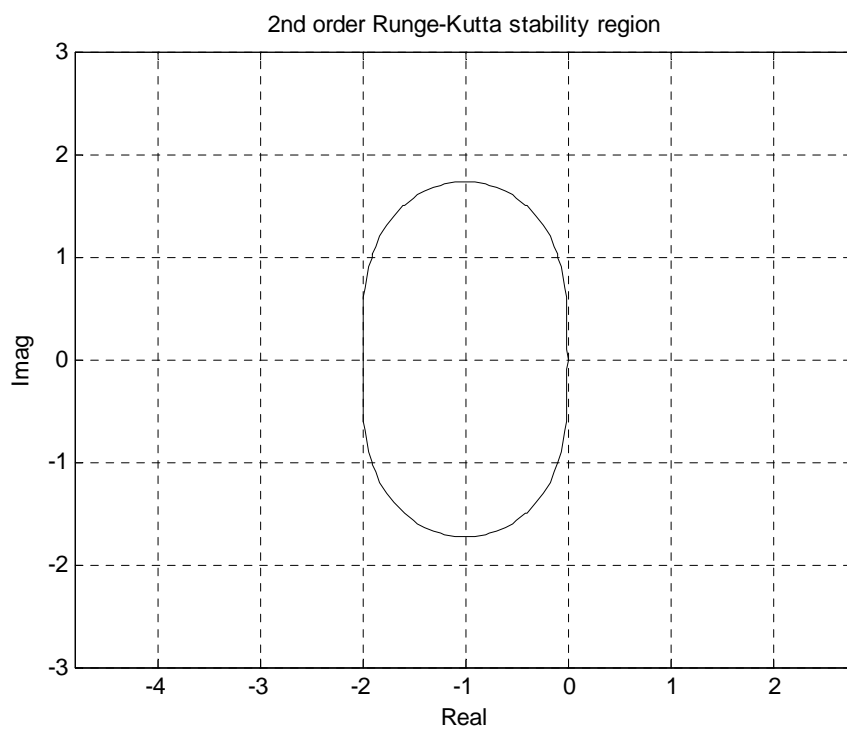


MATLAB1 (“HW1\_1.m”)



MATLAB2 (“f\_is.m”, “RK\_2.m”, “AB\_2.m”, “HW1\_2.m”)

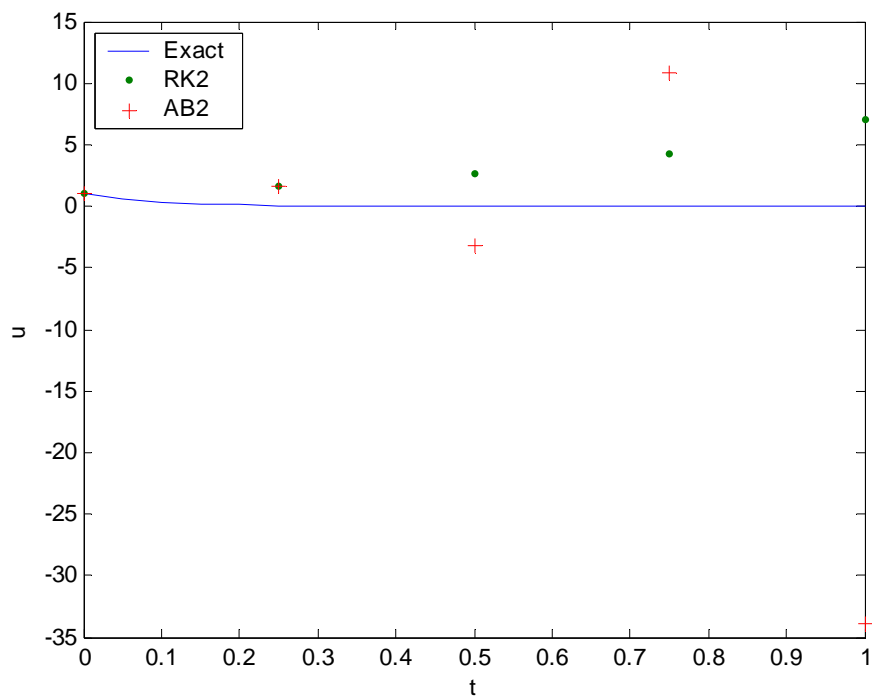
$$u' = -10u \rightarrow a = 10$$

The stability limits of 2<sup>nd</sup> order Runge-Kutta Method:  $a \cdot h_{rk2} = 2 \rightarrow h_{rk2} = 2/10 = 0.2$

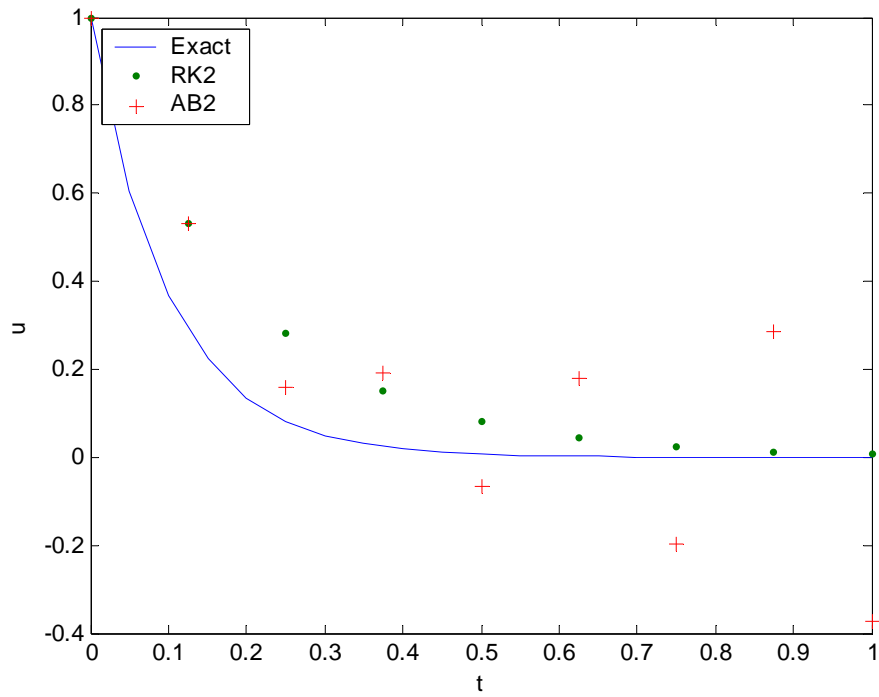
The stability limits of Adams-Bashforth Method:  $a \cdot h_{ab2} = 1 \rightarrow h_{ab2} = 1/10 = 0.1$

1) Matlab (set initial  $h = 1/4 = 0.25$  in “HW1\_2.m”)

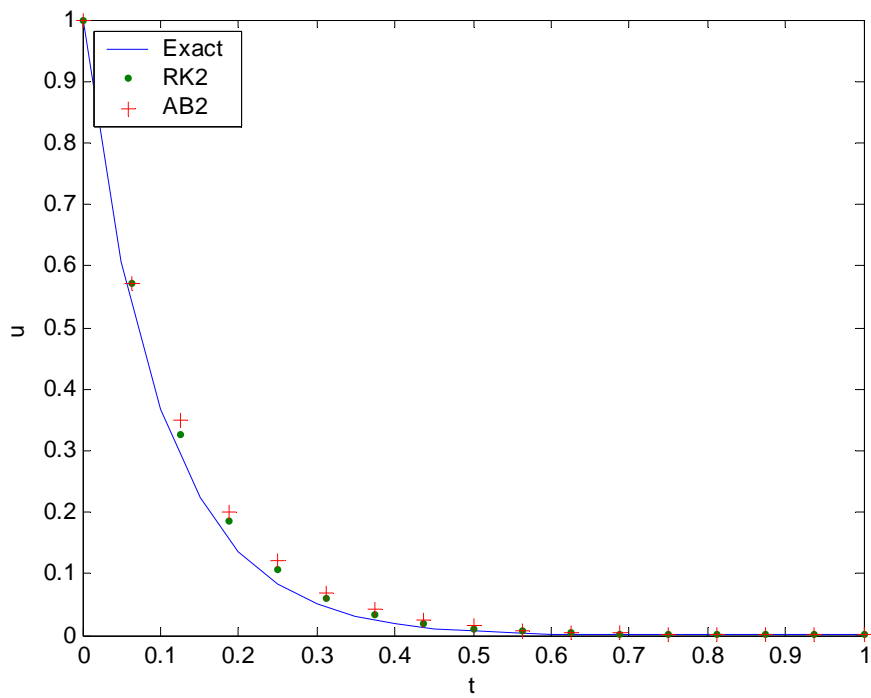
$h = 1/4 = 0.25$



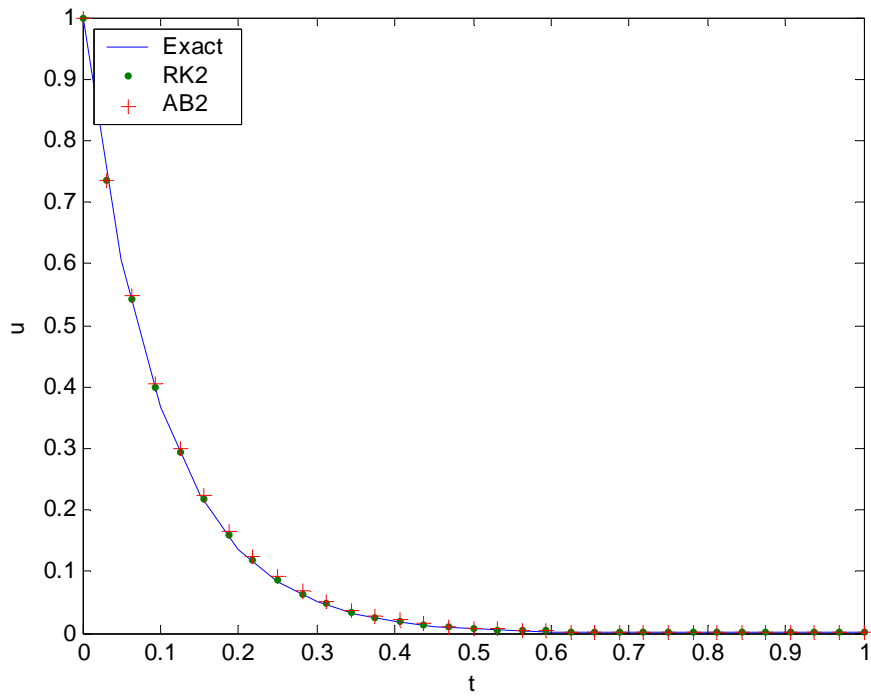
$h=1/8=0.125$



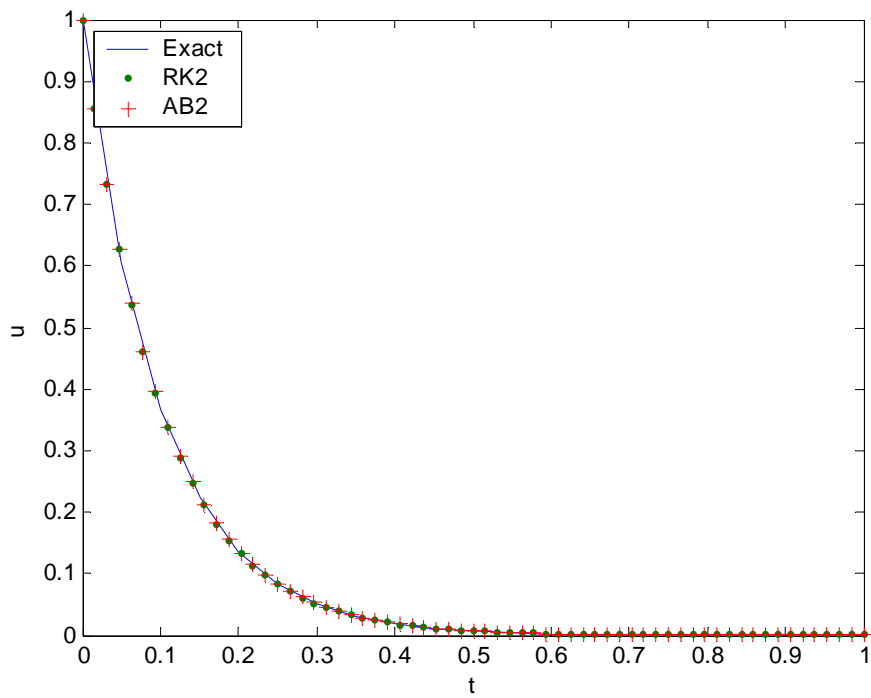
$h=1/16=0.0625$



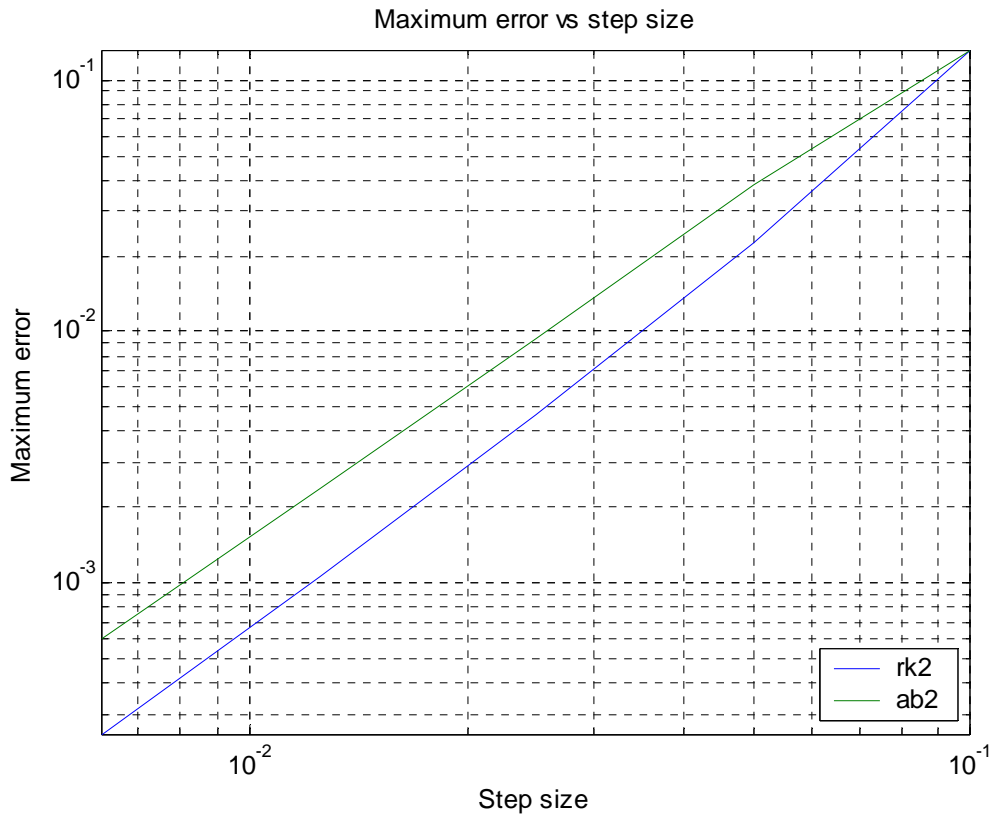
$h=1/32=0.03125$



$h=1/64=0.015625$



2) Accuracy test (set initial h=0.1 in “HW1\_2.m”)



$$\max\_error = C(\text{step\_size})^B \equiv 10^A(\text{step\_size})^B$$

$$\rightarrow \log_{10}(\max\_error) = A + B \log_{10}(\text{step\_size})$$

2<sup>nd</sup> order Runge-Kutta

```
>> prk2=polyfit(log10(h_t),log10(rk2_u),1)
>> prk2 =
    2.2511    1.3199
```

→ A=1.3199, B=2.2511 → p=round(B)=2 ;accuracy

Adams-Bashforth

```
>> pab2=polyfit(log10(h_t),log10(ab2_u),1)
>> pab2 =
    1.9584    1.1038
```

→ A=1.1038, B=2.25 → p=round(B)=2 ;accuracy