Ay190 – Worksheet 10

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We use the shooting method code template to solve our BVP. We guess a $z = y'(a)$ and use an integrator (FE or RK2) to extend to boundary b. We calculate the error between $y(z)$ and our endpoint $B = y(b)$. We then use a rootfinder to improve our guess of z and iterate until desired accuracy. Even with extreme values of z, the process takes 2 iterations (see ws10.py and ws10b.py).

To test for convergence, we run using 10 and 10000 steps. FE converges, see 1 and 2; interestingly, RK2 doesn't. See 3 and 4.

The top figure shows the exact and FE or RK2 solution to our BVP; the subplot shows the error. RK2 is accurate but divergent.

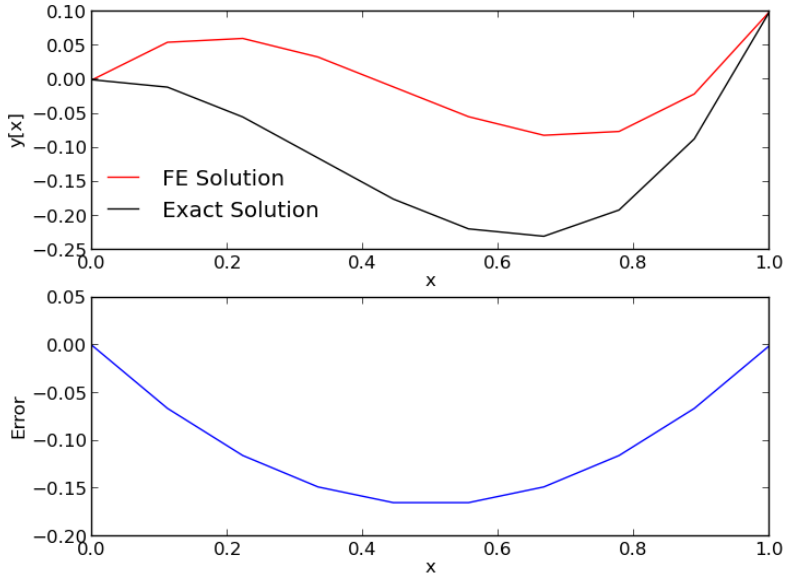

Figure 1: FE, npoints=10

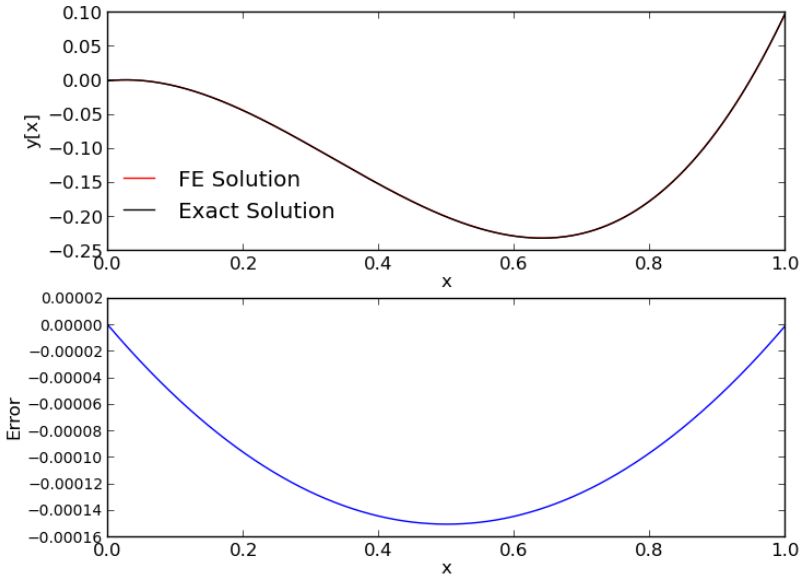

Figure 2: FE, npoints=10000

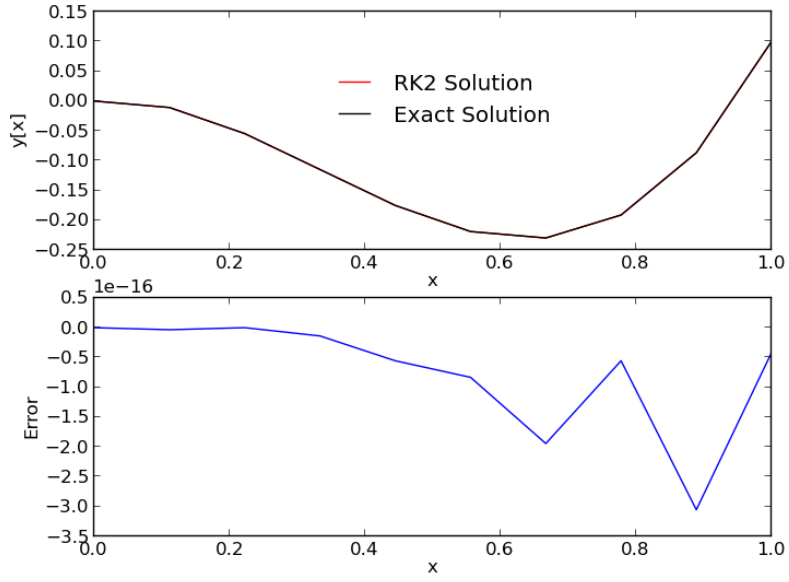

Figure 3: RK2, npoints=10

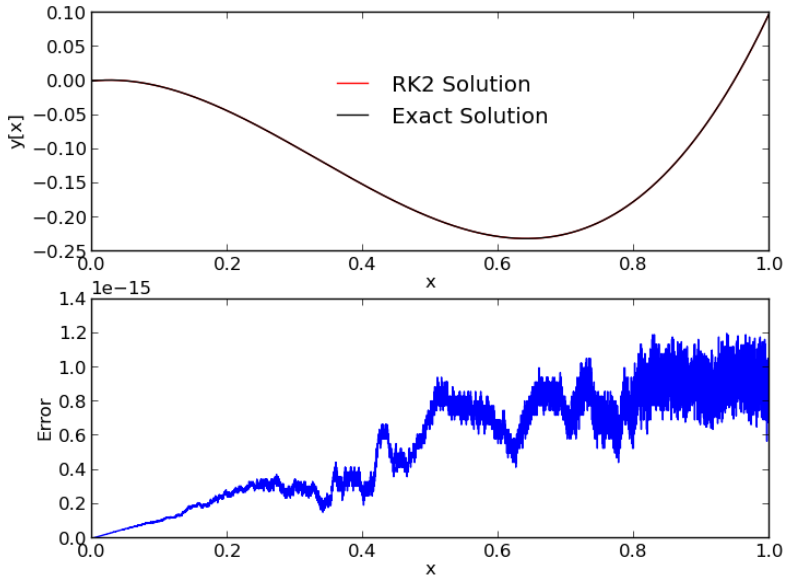

Figure 4: RK2, npoints=10000