

---

---

# MATH 440/540 - Applied Mathematics I

## Homework assignment

*Date assigned:* February 20, 2009

*Due date:* **March 2 , 2009**

---

---

- Include a cover page and *this* problem sheet
- Include the printout of your program(s) for completeness

Consider the following IVP:

$$\frac{du}{dt} + 20u = 0,$$

$$u(0) = 10.$$

1. Find the exact solution  $u_{exact}$  of given IVP.
2. Compute the stability condition for the Forward Euler method.
3. Take  $\Delta t$  satisfying the stability condition and solve the IVP using Forward and Backward Euler methods on the interval  $t \in [0, 1]$ .
4. Take  $\Delta t$  twice smaller then in (3), i.e.  $\Delta t/2$ . Solve the IVP using Forward and Backward Euler methods on the interval  $t \in [0, 1]$ .
5. Compute the error  $E = |u - u_{exact}|$  for each method for each mesh point for both cases:  $\Delta t$  and  $\Delta t/2$
6. Plot the exact and computed solutions vs. time