Math Math 5600 Fall 2012 **Guide for Test 3**

1. (a) Define local truncation error (LTE).
   (b) Define global truncation error (GTE) and relate it to LTE.
   (c) Define "order" of an ODE method and relate it to LTE and GTE.
   (d) Why do we care about LTE/GTE/order?

2. (a) What is a stiff equation?
   (b) Define stability domain.
   (c) Define A-stability for an ODE method.
   (d) Why do we care about stiff equations, stability domains, and A-stability?

3. (a) What makes an ODE method explicit or implicit?
   (b) What are the advantages of explicit methods over implicit methods?
   (c) What are the advantages of implicit methods over explicit methods?

4. (a) State the general form for an [*explicit/implicit*] Runge-Kutta method.
   (b) State the general form for an [*explicit/implicit*] multistep method.

5. How do you decide which ODE method to use?

6. To numerically solve an initial value ODE $y'(t) = f(y(t))$ with $y(t_0) = y_0$, the following method is proposed:

$$y_{n+1} = \quad **\text{RK type}** .$$

   (a) Determine (and prove) the order of this method.
   (b) Determine the stability domain of this method.
   (Leave your answer in the form $\{ \quad * \in * \quad | \quad * < * \quad \}$.)

7. To numerically solve an initial value ODE $y'(t) = f(t, y(t))$ with $y(t_0) = y_0$, the following method is proposed:

$$y_{n+1} = \quad **\text{multistep type}** .$$

   (a) Determine (and prove) the order of this method.
   (b) Determine the stability domain of this method.
   (Leave your answer in the form $\{ \quad * \in * \quad | \quad * ** \quad \}$.)