Spring 2020

MATH7016 Ungraded Concept MCQ VI

General Instructions: Read carefully. Open Book. Circle the one correct answer.

Name:

1. Suppose you want to produce a table of t-values from $t = 0$ to (about) $t = 10$, in steps of $h = 0.1$. Which is *not* a suitable 'stopping rule':
   A. `while dblt < 10`
   B. `until dblt > 10`
   C. `until dblt = 10`
   D. `until abs(dblt-10)<0.1`

2. Which of the following statements are *true*:
   A. We can analytically solve $\dfrac{dy}{dx} = \dfrac{\sin x}{x}$.
   B. Numerical Methods are more accurate than Analytical Methods (MATH7005 & MATH7006).
   C. The exact solution of some initial value problems can be found with zero error.
   D. When a differential equation does not have an exact solution, we have to use a numerical method.

3. Which of the following statements are *true*:
   A. The local error in an approximation is the sum of the global errors.
   B. In general, increasing the step-size reduces the local and global errors.
   C. The global error in an approximation is the sum of the local errors.
   D. If the global error is zero the local errors are also zero.

4. Which of the following statements are true about *Runge-Kutta Methods*
   A. When implementing RK in VBA, the k_i-values can be calculated outside of the loop.
   B. When implementing RK in VBA, I recommend that the k_i-values be calculated after "next x, next y"
   C. When implementing RK in VBA, I recommend that the k_i-values be calculated before "next x, next y"
   D. It is easy to implement RK on the worksheet without using VBA.

5. Which of the following is true about a *boundary value problem*:
   A. We can always find the slope $v(0)$ after two shots.
   B. If we are looking at a BVP on $[x_0, x_n]$, we are aiming to have the 'global error'
   $$|y(x_n) - y_n| = 0.$$
   C. All local and global errors are zero when we use the shooting method.
   D. Given an initial value problem, $y' = F(x, y)$, $y(x_0) = y_0$, we can always turn it into a BVP with an additional boundary condition $y(x_1) = y_1$.

6. Which of the following is true about a *boundary value problem*:
   A. we know the values of y and some of its derivatives at a *single* point x_0
   B. we know the values of y (and perhaps some of its derivatives) at *multiple* points x_1, x_2,...
   C. we can use 'one' ordinary Euler Method to solve the boundary value problem $y'' = F(x, y, y')$
   D. finding the displacement $x(t)$ of a damped harmonic oscillator t seconds after being released with $x(0) = 1$ and $x'(0) = 0$ is a boundary value problem.