Spring 2020

MATH7016 Ungraded Concept MCQ VII

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

Name:

1. Which of the following is *false* about the finite difference approach to Laplace's Equation:
   A. finite differences allow us to approximate differential equations by linear equations
   B. linear equations can be solved exactly
   C. like the Laplace Transform Method, we find *exact* solutions with the finite difference method, by replacing differential equations with equations that are easier to solve
   D. if we use finite differences to rewrite $\frac{dy}{dx} = F(x, y)$, we get Euler's Method

2. How do we make finite differences *more accurate*?
   A. we reduce the number of points in the mesh
   B. we increase the mesh-size, Δx
   C. we make the second derivative smaller
   D. we increase the number of points in the mesh

3. Suppose we use the Jacobi Method after using the finite difference method. Which of the following are *true*:
   A. the equations are exact and our solutions to them are exact
   B. the equations are exact but our solutions to them are approximate
   C. the equations are approximate but our solutions to them are exact
   D. the equations are approximate and our solutions to them are approximate

4. Which best describes why we use a Stopping Rule when implementing the Jacobi Method:

    A. we need a stopping rule to stop the calculation
    B. to make sure we have enough *precision* in our approximations
    C. if we know that the iterations *converges*, we stop the calculations when we think we are close to convergence
    D. if we aren't close to the solution after a large number of loops we will never get close

5. What is the difference between the Jacobi and Gauss-Seidel Methods:

    A. they are different names for the same thing
    B. the Jacobi Method is iterative and Gauss-Seidel is recursive
    C. the Jacobi Method uses the previous values to calculate the next values, while the Gauss-Seidel Method uses the previous values and any available next values to calculate the next values
    D. they use different initial values

6. When using the Gauss-Seidel Method for Laplace's Equation, to start we need to pick an initialising temperature distribution. Which of the following statements are *false* in general:

    A. If you try and choose an initialising temperature distribution close to the exact temperature distribution, convergence will be faster.
    B. If you don't pick an initialising temperature distribution close to the exact temperature distribution, the Gauss-Seidel Method might not converge.
    C. It doesn't matter what the initialising temperature distribution is, the Gauss-Seidel Method will converge.
    D. Choosing a constant initialising temperature distribution, with each temperature equal to the average of all boundary temperatures, is a good choice and should help speed convergence.