Math 298: Directed Group Study

Fundamental Concepts in Computational and Applied Mathematics

December 9, 2013

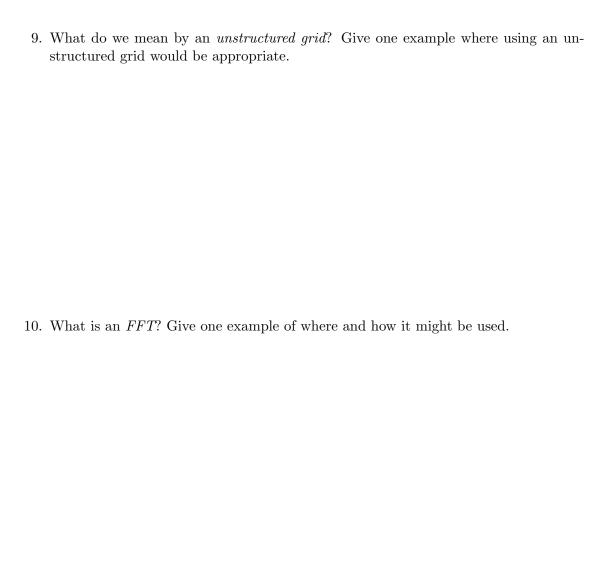
Instructions: This is a self-assessment quiz for your own use. Give yourself 1 point for each question correctly answered. For maximum benefit I suggest taking the quiz without reviewing the class lecture slides.

1. Define *stability* and *conditioning*. Describe the difference between the two concepts and how they are related to numerical problems and algorithms.

2. Suppose we have a problem with a condition number, $\kappa=10^6$. What can we say about the accuracy of our computed solution?

| 3. | Suppose we have to solve, $Ax=b$, where the matrix A is $dense$. Give some advantages and disadvantages of using the following three methods: LU, LU with partial pivoting, QR. |
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| 4. | What do we mean by a sparse matrix? |
| 5. | What is meant by an $iterative\ method$ for solving a system of linear equations as opposed to a $direct$ method? |

| 6. | What is a <i>splitting method</i> for solving a system of linear equations? Give an example |
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| 7. | What is the defining characteristic of a <i>structured grid</i> ? Give one example where you would use a structured grid. |
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| 8. | What is a stencil? |
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11. What is an N-body problem and where do they arise? What principle is used to improve the computational efficiency of standard algorithms for N-body problems?

| 12. | What is meant by a <i>model-based</i> approach for solving a system of <i>nonlinear equations</i> ? |
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| 13. | What is the main idea underlying <i>Newton's</i> method for solving nonlinear equations? |
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| 14. | Give some advantages and disadvantages of Newton's method for the solution of either nonlinear equations or optimization? |
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| 15. | What are the 3 key elements of a good talk? |
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| 16. | Name one common mistake when giving a talk? |
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| 17. | What was your favorite algorithm or NA Classics paper that we discussed in class? |
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