Study Questions for Exam 2

1. Finding Primes - Describe a reasonably efficient way to find 100 decimal digit primes.
2. Raising to a Power - Describes an efficient way to raise a number, x, to a high power, y, mod a large number z , which, if y is divisible by 4 gives you a square root and fourth root of the answer in the process.
3. Groups and Lagrange`s theorem: be prepared to prove it and use it
4. Euclid's algorithm - Given 10 digit integers, A and B, how would you implement finding their gcd on a spreadsheet? Expressing that gcd as a linear combination of A and B?
5. Chinese remainder theorem - State and prove the Chinese remainder theorem.
6. RSA algorithm – Explain how it works and Implement it on a spreadsheet
7. Factoring Numbers by Iteration - What is this method? How large a number can you hope to handle by it, using, say 10^12 iterations?
8. Matching - State and outline a proof of Hall's Marriage theorem
9. Five color theorem - State and prove it
10. Kuratowski Theorem - Which of the following graphs are planar (graph described by edges as vertex pairs or by a diagram).
11. Perfect Graphs?
12. Stable Marriage Theorem - State and prove the stable marriage theorem
13. Describe how one multiplies numbers using the FFT.
14. Implement it on a spreadsheet using 32nd roots of unity.
15. What is the basic recursion of the FFT?
16. Make a diagram showing how the FFT can be implemented on a spreadsheet.
17. What is the Finite Fourier Transform and how is it inverted?
18. Sequential choice seeking best expected rank.
19. Sequential choice finding best rank.
20. Use a spreadsheet to compute the exact probability of successfully choosing the best choice in a sequential situation with 20 candidates. Where is the best threshold?
21. Simplex Algorithm - Describe it in the simplest case. Apply a pivot to the following example. Use a spreadsheet to pivot until you get the optimum in the following examples.
22. Handling Degeneracy - What is degeneracy? What do you do about it in the simplex algorithm?
23. Handling Unfeasible Origin - What do you do to apply the simplex algorithm when the origin is unfeasible?
24. Handling Equality Constraints - What change do you make to deal with same?
25. Handling Unconstrained Variables
26. State and Prove the duality theorem of Linear Programming
27. The Duality Bound