REVIEW FOR TEST 3 OF MATH 121 :

The first and best line of defense is to complete and understand the homework and lecture examples. In particular you should focus on the homework and examples from lecture which concerned the following questions or tasks:

1. Know the domains and range of an exponential function. Be able to graph them and/or identify their graphs, be able to find their domain and range. (5.1#7-10)

2. Know the domains and range of a logarithmic function. Be able to graph them and/or identify their graphs including vertical asymptotes and x-intercepts. (5.2 Example 10, 5.2#39-42, 69,71,73,75,77)

3. Know how exponential and logarithmic functions are related. In particular remember that for any $a > 0, a \neq 1$ we defined the logarithmic function to satisfy the conditions below:
$$a^{\log_a(y)} = y,\ y > 0, \qquad \log_a(a^x) = x,\ x \in \mathbb{R}$$

4. When the base $a = e = 2.718...$ then we use the special notation $\log_e(x) = \ln(x)$ read "natural log of x". Also $a^x = e^x$ is "the exponential function". If not otherwise specified, usually people take $a = e$ by default. The choice $a = 10$ and $a = 2$ are also of particular interest and there are common special notations for those cases; in particular $\log_{10}(x) = \log(x)$.

5. What is the one-one property? What is it good for? (see 5.1#45-52, 5.2#79-86)

6. Know your logarithm properties (nice box on page 406 of text). Be able to collect or expand algorithms as we discussed in lecture and as is indicated in the text's section 5.3 homework (expanding 5.3#49,51,55,57,59 and collecting 5.3# 61,65, 71,73,75, 78).

7. A likely format of a test question about collecting,
$$\boxed{4\ln(x^3) + \frac{1}{3}\ln(x+6) - 2\ln(x^3-9) = \ln\left(\frac{x^A(x+6)^B}{(x^3-9)^C}\right), \quad find\ A, B, C}$$

8. A likely format of a test question about expanding,
$$\boxed{\log\left(\frac{(x-4)^2(x+7)^{1.5}}{(x^2+1)^{-2}}\right) = A\log(x+B) + C\log(x-2) + D\log(x+7) + E\log(x^2+1), \quad find\ A, B, C, D, E}$$

9. I will provide the change of base formula if it is needed.

10. Be able to solve transcendental equations involving exponential or logarithmic functions. I will allow you to either use the 1-1 property or to actually "take the exponential of the equation" or "take the log of the equation". These amount to the same algebraic operation. In short, be able to solve problems like (see 5.1#45-52, 5.2#79-86) and 5.3#9-20, 5.3 #25-66, 75-102). Now I will not ask for the "decimal form of the answer" and probably if you can do the odd-#'s of those it will show you are ready.

11. Be able to solve two equations with two unknowns. (many methods available, could use substitution, adding subtracting equations, multiplication by inverse or Kramer's Rule, there will be freedom in your choice on part of the test) (see problems 6.2#11-20)

12. Be able to solve three equations with three unknowns. (many methods available, could use substitution, adding subtracting equations, multiplication by inverse or Kramer's Rule, there will be freedom in your choice on part of the test)(see problems 6.3#13,15,16,17)

13. Homeworks 6.2#43,45,47,49 were fun.

14. Know what an "m x p" sized matrix is. How many rows? How many columns? (7.1#1-6)

15. Know your matrix arithmetic. Be able to add, subtract, multiply by a number various sized matrices. Be able to multiply matrices that have appropriate sizes. I probably will not go beyond 3 rows and 3 columns. (see 7.2#5,6,11, 13, 31, 33, 41, 43, 45, 47)

16. Know the definition of matrix equality. A single matrix equation often contains many ordinary equations. (7.2#1,2 etc…)

17. Be able to calculate the determinant of a 2x2 or 3x3 matrix.(see 7.4#1-16, 37-46)

18. Be able to convert a system of equations into its matrix form. As typically used the notation $A\vec{x} = \vec{b}$ for an abbreviated notation of the matrix form. I'll want you to write out the box of numbers that defines A for a given system. (7.2#51-58 part a only, I will not ask you to to perform the Gauss Jordon elimination on a matrix.)

19. Be able to find the "augmented coefficient matrix" for a system of equations. (7.1#7-15)

20. Given the completely reduced row form or the "rref" of the augmented coefficient matrix be able to read off solutions in the unique solution case. (I will not test on the infinitely many or inconsistent solution case, I leave that for Math 321)(7.1#47-50)

21. Be able to find multiplicative inverse of a 2x2 matrix (see 7.3#11-18)

22. Given A^{-1} for a system of equations $A\vec{x} = \vec{b}$ be able to solve the system by multiplication by A^{-1}. (as I have said many times by now I do not expect you be able to find A^{-1} except for the 2x2 case)(see 7.3# 45,47)

23. Know the graphical significance of solutions for two equations and two unknowns. (only in this case will I touch on the cases of "no solutions" or "infinitely many solutions" but here it is easy to visualize, see 6.2#31-34)

24. **Comment: I will update this review in a little bit to include a likely test format. I am not ready to post that yet, but this ought to get you started. Thanks, James.**