Differential Equations Test I Overview

All page numbers refer to my lecture note which are posted online. The problems are taken from the text. Don't hesitate to contact me if something seems to contradict statements I made in class and/or you have no idea what in the world I'm talking about. The point of this is to make sure you have all the bases covered. As always your first best line of defense is to complete and understand the homework and lecture examples. I will rule out a few of the problems which were assigned for breadth, namely $1.2\#23, 1.2\#30, 2.4\#32, 2.4\#33, 3.4\#25, 4.2\#34$. Also please redo $4.6\#2, 3$ using equation 10 as I indicated would be advantageous in 4.6#7.

1. Be able to derive trigonometric identities as I did in the first lecture. (like those examples given on pages 5i-6i, I'll remind you that $e^{ix} = \cos(x) + i\sin(x)$ but the rest is upto you.)

2. What is a solution to a differential equation ?

3. Be able to identify features such as: order, linear, homogeneous, nonhomogeneous, constant coefficient DEqns.

4. Solve first order ODEs by separation of variables.
   (see homeworks from 2.2,2.3 and 2.4 and examples E1-E4 on pg7)

5. Solve first order ODEs by the integrating factor method.
   (see homeworks from 2.4 and examples E1-E2 on pg9)

6. Solve first order ODEs by identifying them as an exact equation.
   (see homeworks from 2.3 and examples E1-E3 on pgs10-12)

7. Be prepared for problems similar to those we did on mixing tanks, Newton's Law of Cooling, or possibly Newtonian mechanics (pgs 13-16). Be able to solve applied problems similar to 3.2#3,3.2#3,3.3#3,3.4#5.

8. Be able to solve n-th order homoegeneous constant coeff. ODEs with or without initial conditions.
   (See homeworks from 4.2,4.3,6.2 and examples E1-E7 on pg30, also try to understand the operator idea)

9. Be able to solve n-th order nonhomoegeneous constant coeff. ODEs with or without initial conditions.
   (See homeworks from 4.4,4.5,4.6,6.3,6.4 and see pages 31-36,39)

10. When can you use the method of undetermined coefficients, what is it good for ?
    (Section 6.3 really answers this, but 4.4,4.5 give many examples, see pages 31-36 and 39)

11. When is the homogeneous solution the general solution ?

12. What is the particular solution, how do you form the general solution ?

13. When is the method of variation of parameters useful ? What does it give you ?
    (See homeworks from 4.6 and 6.4 and pages 35-39, I will not ask you to derive equation 10 on test I)

14. What does the Wronskian tell us about linear indepence ?

15. How can we find the anihilator of a function ?
    (see section 6.3 and page 34)

16. What does the anihilator method help us remember ?
    (see section 6.3 and page 34)

17. What is overlap? Why do you not need to worry about remembering oodles of formulas anymore?
    (see anihilator method plus the general idea of linear independence, always need n-LI solutions)

18. What does the anihilator method not do ?
    (see section 6.3 and page 34)

19. What is the principle of superposition ? What kind of DEqn does it hold for ?
    (see section 4.5 and page 34)

20. I have old tests online, wouldn't hurt to look over them to see if you missed something.

The test will be similar in content to that I gave last year. I plan to give you the basic formulas for variation of parameters, it's upto you to interpret them correctly. It's pretty much always my goal to cover as many of these topics as possible without making the test too long.