MATH 2204 **Sample Final Exam/Study Guide**

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Name:

Instructions:

- All answers must be written clearly.
- You may use a calculator (TI-84 or below), but you must show all your work in order to receive credit. This includes any multiple choice questions! No credit will be given to any problem unless work is shown.
- Be sure to erase or cross out any work that you do not want graded.
- If two answers are circled in the multiple choice, then zero credit is given.
- If you need extra space, you may use the back sides of the exam pages (if you do, please write me a note so that I know where to look).
- Any cheating will result in an immediate F in the course.
- Partial credit will be given to open ended problems.

Question:	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Points:	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Score:														

1. Study HW Problems 1-3 in Section 2.1 - First Order Linear Equations
   - For more Sample Problems with solutions:
     - Click here: http://tutorial.math.lamar.edu/Classes/DE/Linear.aspx
2. Study HW Problems 1-3 in Section 2.2 - First Order Separable
   - For more Sample Problems with solutions:
     - Click here: http://tutorial.math.lamar.edu/Classes/DE/Separable.aspx
3. Study HW Problems 1-7 in Section 2.4 - Mixing Problems - only setting up the IVP
   - For more Sample Problems with solutions:
     - Click here: http://tutorial.math.lamar.edu/Classes/DE/Modeling.aspx
4. Study HW Problems 1-4 in Section 2.7 - Autonomous Equations - Phase Lines, Classify Eq. Solutions, and sketch possible solutions
   - For more Sample Problems with solutions:
     - Click here: http://tutorial.math.lamar.edu/Classes/DE/EquilibriumSolutions.aspx
5. Study HW Problems 1-5 in Section 3.1 - 2nd Order Linear Homogeneous constant coefficients - Real distinct roots
   - For more Sample Problems with solutions:
     - Click here: http://tutorial.math.lamar.edu/Classes/DE/RealRoots.aspx
6. Study HW Problems 1-2 in Section 3.3 - 2nd Order Linear Homogeneous constant coefficients - complex roots
   - For more Sample Problems with solutions:
     - Click here: http://tutorial.math.lamar.edu/Classes/DE/ComplexRoots.aspx
7. Study HW Problems 1-3 in Section 3.4.1 - 2nd Order Linear Homogeneous constant coefficients - Real repeated roots
   - For more Sample Problems with solutions:
     - Click here: http://tutorial.math.lamar.edu/Classes/DE/RepeatedRoots.aspx
8. Study HW Problems 1-7 in Section 3.5 - non-homogeneous equations - MOUC
   - For more Sample Problems with solutions:
     - Click here: http://tutorial.math.lamar.edu/Classes/DE/NonhomogeneousDE.aspx
9. Study HW Problems 1-6 in Section 4.1 - Higher Order Systems - homogeneous
   - For more Sample Problems with solutions:
     - http://tutorial.math.lamar.edu/Classes/DE/HOHomogeneousDE.aspx
10. Study HW Problems 1-4 in Section 4.2 - Higher Order Systems - non-homogeneous
    - For more Sample Problems with solutions:
      - http://tutorial.math.lamar.edu/Classes/DE/HOUndeterminedCoeff.aspx

11. Study only HW Problem 4 in Section 6.1 - Intro to Laplace Transforms
    - For more Sample Problems with solutions:
        - http://tutorial.math.lamar.edu/Classes/DE/LaplaceTransforms.aspx
12. Study only HW Problem 1-4 in Section 6.2 - Inverse Laplace
    - For more Sample Problems with solutions:
        - http://tutorial.math.lamar.edu/Classes/DE/InverseTransforms.aspx
13. Study only HW Problem 1-4 in Section 6.3 - Solving IVP with Laplace
    - For more Sample Problems with solutions:
        - http://tutorial.math.lamar.edu/Classes/DE/IVPWithLaplace.aspx
14. Study only HW Problem 1-3 in Section 6.4 - Heaviside functions
    - For more Sample Problems with solutions:
        - http://tutorial.math.lamar.edu/Classes/DE/StepFunctions.aspx

Formula Sheet

- **<u>1st Order Linear ODE:</u>** $\frac{dy}{dt} + p(t)y = g(t)$
  - Integrating Factor: $\mu(t) = e^{\int p(t)dt}$
  - Then $y(t) = \frac{1}{\mu(t)}\left[\int \mu(t)g(t)dt + C\right]$
- **<u>General Solution Theorem for Homogeneous Equations:</u>**

Theorem 1 ***(General Solution Theorem)*** *Suppose y_1 and y_2 are two solutions to the ODE*

$$y'' + p(t)y' + q(t)y = 0$$

in some interval I, where p, q are continuous. Then the family of solutions

$$y(t) = c_1y_1(t) + c_2y_2(t)$$

for arbtitrary c_1, c_2 is the ***general solution*** *(meaning includes every solution to the ODE) if and only if the Wronskian $W(y_1, y_2)$ is not zero for at least one point t_0 in I.*

	$f(t) = \mathcal{L}^{-1}\{F(s)\}$	$F(s) = \mathcal{L}\{f(t)\}$
1.	1	$\dfrac{1}{s}$
2.	e^{at}	$\dfrac{1}{s-a}$
3.	t^n	$\dfrac{n!}{s^{n+1}}$
4.	$t^p \ (p > -1)$	$\dfrac{\Gamma(p+1)}{s^{p+1}}$
5.	$\sin at$	$\dfrac{a}{s^2+a^2}$
6.	$\cos at$	$\dfrac{s}{s^2+a^2}$
7.	$\sinh at$	$\dfrac{a}{s^2-a^2}$
8.	$\cosh at$	$\dfrac{s}{s^2-a^2}$
9.	$e^{at}\sin bt$	$\dfrac{b}{(s-a)^2+b^2}$
10.	$e^{at}\cos bt$	$\dfrac{s-a}{(s-a)^2+b^2}$
11.	$t^n e^{at}$	$\dfrac{n!}{(s-a)^{n+1}}$
12.	$u_c(t)$	$\dfrac{e^{-cs}}{s}$
13.	$u_c(t)f(t-c)$	$e^{-cs}F(s)$
14.	$e^{ct}f(t)$	$F(s-c)$
15.	$f(ct)$	$\dfrac{1}{c}F\left(\dfrac{s}{c}\right), \ c > 0$
16.	$\displaystyle\int_0^t f(t-\tau)\,g(\tau)\,d\tau$	$F(s)\,G(s)$
17.	$\delta(t-c)$	e^{-cs}
18.	$f^{(n)}(t)$	$s^nF(s) - s^{n-1}f(0) - \cdots - sf^{(n-2)}(0) - f^{(n-1)}(0)$
19.	$(-t)^n f(t)$	$F^{(n)}(s)$