PRACTICE TEST 3

Math 271 - Differential Equations **Score:** _____ out of 100

Name: _____

Read all of the following information before starting the exam:

- You have 50 minutes to complete the exam.
- Show all work, clearly and in order, if you want to get full credit. Please make sure you read the directions for each problem. I reserve the right to take off points if I cannot see how you arrived at your answer (even if your final answer is correct).
- Please box/circle or otherwise indicate your final answers.
- Please keep your written answers brief; be clear and to the point. I will take points off for rambling and for incorrect or irrelevant statements.
- This test has 5 problems and is worth 100 points. It is your responsibility to make sure that you have all of the pages!
- Good luck!

1. $x = 0$ is an ordinary point of the differential equation:

$$y'' + 2xy' + 2y = 0.$$

Find two linearly independent power series solutions about $x = 0$. You should write down the first three nonzero terms of each series solution.

$y_1 =$

$y_2 =$

2. Find the following Laplace transforms

(a) $\mathscr{L}\{3 + 5t + \cos(4t)\}$

(b) $\mathscr{L}\{e^{-t}\sin(3t)\}$

(c) $\mathscr{L}\{t\mathscr{U}(t-2)\}$

3. Find the following **inverse** Laplace transforms

(a) $\mathscr{L}^{-1}\left\{\dfrac{1}{s^4}+\dfrac{1}{s^2+9}\right\}$

(b) $\mathscr{L}^{-1}\left\{\dfrac{1}{(s-3)^{10}}\right\}$

(c) $\mathscr{L}^{-1}\left\{e^{-2s}\left(\dfrac{s}{s^2+1}\right)\right\}$

4. Write $f(t)$ in terms of unit step functions (Heaviside functions) if

$$f(t) = \begin{cases} t^2, & 0 \le t < 3, \\ 0, & 3 \le t < 4. \\ 1, & 4 \le t. \end{cases}$$

$f(t) =$

5. Use the Laplace transform to solve the following initial value problem:

$$y' + 3y = 13\sin(2t), \quad y(0) = 6$$

$y(t) =$