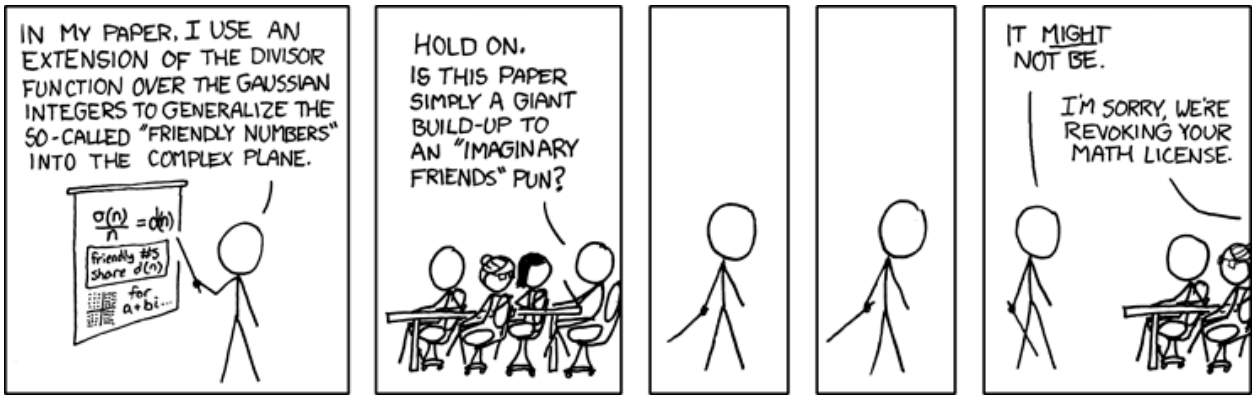
MATH 420 – Differential Equations
American River College
Kristin Lui

Name: _____

Student ID: _____

EXAM 3

- The exam is closed book, notes and neighbor. No calculators.
- SHOW ALL WORK!!!
- Good luck!



Problem	1	2	3	4	5	6	Bonus	Total
Score								
Possible	15	25	13	20	15	12	10	100

MATH 420 – Differential Equations
Kristin Lui

1. (15 points) Using the solution about the ordinary point $x = 0$, find the recurrence relation for the DE $y'' + xy = 0$

MATH 420 – Differential Equations
Kristin Lui

2. (25 points) Use the Laplace Transform Table for the problems below:

   a. (12 points) Using transforms 18 and 19 in the Laplace transform table, evaluate the inverse transform below.

$$\mathcal{L}^{-1}\left\{\frac{2s-2}{s^2-4s+8}\right\}$$

   b. (13 points) Evaluate the Laplace Transform

$$\mathcal{L}\{\ (t-3)\ \mathcal{U}(t-2) -\ \ (t-2)\mathcal{U}(t-3)\}$$

MATH 420 – Differential Equations
Kristin Lui

3. (13 points) Find the general solution of the given system of equations below.

$$X' = \begin{pmatrix} 2 & -1 \\ 3 & -2 \end{pmatrix} X$$

4. (20 points) Using the general solution from problem 3, find the particular solution for the system below.

$$X' = \begin{pmatrix} 2 & -1 \\ 3 & -2 \end{pmatrix} X + \begin{pmatrix} 1 \\ -1 \end{pmatrix} e^t$$

MATH 420 – Differential Equations
Kristin Lui

5. (15 points) For the DE below, find the singular points and classify the points as regular or irregular. Include justification for your classification.

$$x^2(1-x^2)y'' - \frac{2}{x}y' + 4y = 0$$

MATH 420 – Differential Equations
Kristin Lui

6. (12 points) Use the Laplace Transform to solve the initial value problem

$$y' + 4y = e^{2t} \qquad y(0) = 1$$

Bonus (10 points) Evaluate the inverse Laplace Transform below.

$$\frac{2(s-1)e^{-2s}}{s^2 - 2s + 2}$$