MATH 319, Fall 2013, Assignment 6

Due date: Friday, October 25

Name (printed): _____

UW Student ID Number: _____

Discussion Section: (circle)

Liu Liu:	**301**	**302**	**303**	**304**
Huanyu Wen:	**305**	**306**	**323**	**324**
Dongfei Pei:	**325**	**326**	**329**	
Kai Hsu:	**327**	**328**		

Instructions

1. Fill out this cover page **completely** and affix it to the front of your submitted assignment.
2. **Staple** your assignment together and answer the questions in the order they appear on the assignment sheet.
3. You are encouraged to collaborate on assignment problems but you must write up your assignment independently. **Copying is strictly forbidden!**

Correctness
/20

Completeness
/5

Total:	/25
Bonus:	/3

Non-Homogeneous DEs, Variation of Parameters

Suggested problems:

Section 3.5: 1-26, 29, 30
Section 3.6: 1-10,13-18, 28-32

Problems for submission:

Section 3.5: 10, 13, 18, 23(a)
Section 3.6: 4, 8, 17, 30
(Justify your answers for full marks!)

Bonus! A more technically correct statement of the variation of parameters formula is

$$y_p(x) = -y_1(x)\int_{x_0}^{x} \frac{y_2(s)g(s)}{W(y_1,y_2)(s)}\,ds + y_2(x)\int_{x_0}^{x} \frac{y_1(s)g(s)}{W(y_1,y_2)(s)}\,ds,$$

which takes the initial point x_0 into account.

Consider the nonhomogeneous second order DE

$$a\frac{dy^2}{dx^2} + b\frac{dy}{dx} + cy(x) = g(x).$$

Show that the particular solution $y_p(x)$ may be computed by

$$y_p(x) = \int_{x_0}^{x} K(x-s)g(s)\,ds$$

where

$$K(z) = \begin{cases} \dfrac{e^{r_2 z} - e^{r_1 z}}{r_2 - r_1}, & \text{if } b^2 - 4ac > 0 \\ ze^{rz}, & \text{if } b^2 - 4ac = 0 \\ \dfrac{e^{\alpha z}\sin(\beta z)}{\beta}, & \text{if } b^2 - 4ac < 0, \end{cases}$$

where r_1, r_2, r, α, and β correspond to the various roots of r from the theorem from class.