# Review for Exam II MATH 2306 (Ritter) 

Sections Covered: 4.1, 4.2, 4.3, 4.4, (4.6 ?)

This review is provided as a courtesy to give some idea of what material is covered. Nothing else is intended or implied.
(1) Determine whether the set of functions is linearly dependent or linearly independent on the indicated interval.
(a) $\quad y_{1}(x)=e^{x+1}, \quad y_{2}(x)=e^{x-1}, \quad(-\infty, \infty)$
(b) $\quad f_{1}(x)=\sin x, \quad f_{2}(x)=\tan x, \quad\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$
(c) $\quad g_{1}(t)=t, \quad g_{2}(t)=t^{2}, \quad g_{3}(t)=t^{3}, \quad(0, \infty)$
(2) Find the general solution of the homogeneous equation.
(a) $y^{\prime \prime}-4 y^{\prime}+5 y=0$
(b) $y^{\prime \prime}+6 y^{\prime}+9 y=0$
(c) $y^{\prime \prime}-36 y=0$
(d) $y^{(4)}+3 y^{\prime \prime}-4 y=0$
(3) Solve the IVP
$y^{\prime \prime}-3 y^{\prime}+2 y=0 \quad y(0)=0, \quad y^{\prime}(0)=2$
(4) Find the general solution of the nonhomogeneous equation

$$
y^{\prime \prime}+6 y^{\prime}+9 y=e^{x}+3 e^{-3 x}
$$

(5) Determine the form of the particular solution.
(a) $y^{\prime \prime}-4 y^{\prime}+5 y=x \cos 2 x$
(b) $y^{\prime \prime}+y=x^{3}+e^{x}$
(c) $y^{\prime \prime}-4 y^{\prime}+5 y=x e^{2 x} \sin x$
(d) $y^{\prime \prime}-2 y^{\prime}+y=1+e^{x}$
(6) Given one solution of the homogeneous equation, use reduction of order to find a second linearly independent solution.
(a) $\quad(x-1) y^{\prime \prime}-x y^{\prime}+y=0 \quad x>1, \quad y_{1}(x)=e^{x}$
(b) $\quad x^{2} y^{\prime \prime}+3 x y^{\prime}-3 y=0 \quad x>0, \quad y_{1}(x)=x^{-3}$

## The remaining questions involve section 4.6.

(7) Use 6(b) to solve the (non-homogeneous) initial value problem

$$
x^{2} y^{\prime \prime}+3 x y^{\prime}-3 y=15 x^{2}, \quad y(1)=0, \quad y^{\prime}(1)=0
$$

(8) Find the particular solution to the nonhomogeneous ODE using the method of variation of parameters.
$y^{\prime \prime}-4 y^{\prime}+4 y=(x+1) e^{2 x}$
(9) Solve the IVP.
$y^{\prime \prime}-4 y^{\prime}+4 y=(x+1) e^{2 x} \quad y(0)=3, \quad y^{\prime}(0)=-3$

