SIIT GTS211 Section 1 First Semester 2007 Dr. Ruben

Quiz 2 SOLUTION

Prob. 1	Prob. 2	Prob. 3	Prob. 4
1	1	1	1
2	2	**2**	2
3	3	3	3
4	**4**	4	4
5	5	5	**5**

Problem 1. The general solution of $y'' = 6y' - 9y$ is

(1) $y = c_1e^{4x} + c_2e^{-x}$ (2) $y = y = c_1e^{2x} + c_2x$ (3) $y = e^x(c_1 \cos 2x + c_2 \sin 2x)$

(4) $y = x + C(x + 1)|$ (5) $y = e^{3x}(c_1x + c_2)$

Regrouping, $y'' - 6y' + 9y = 0$. The characteristic equation is

$k^2 - 6k - 9 = (k - 3)^2$, with double-root $k = 3$. The general solution is

$$y = e^{3x}(c_1x + c_2)$$

The answer is 5.

Problem 2. The general solution of $y'' - 2y' + 4y = 0$ is

(1) $= c_1e^{2x} + c_2e^{5x}$ (2) $y = c_1x^2 + c_2x$ (3) $e^{2x}(c_1 + c_2x)$

(4) $e^x(c_1 \cos \sqrt{3}x + c_2 \sin \sqrt{3}x)$ (5) $2x + x^2 + y = C$

The characteristic equation is

$k^2 - 2k + 4 = 0$ $k = \frac{2 \pm \sqrt{4-16}}{2} = \frac{2 \pm \sqrt{-12}}{2} = \frac{2 \pm \sqrt{3}i}{2} = 1 \pm \sqrt{3}i$. The general solution is

$$y = e^x(\cos 3x + \sin 3x).$$

The answer is 4.

Problem 3. Find a particular solution of $y'' + 2y' + y = 2e^{2x}$

(1) $Y = \ln(x^2 + C)$ (2) $Y = (2/9)\,e^{2x}$ (3) $y = Cx^3$

(4) $Y = 3\sin x + 2\cos x$ (5) $Y = 2x - 4$

By the method of the undetermined coefficients, we try $Y = Ae^{2x}$.

$Y' = 2Ae^{2x}$, $Y'' = 4Ae^{2x}$. Plugging in the equation

$Ae^{2x}(4 + 4 + 1) = 2e^{2x} \Rightarrow 9A = 2.$ $A = 2/9$

Therefore, the particular solution is

$$\boldsymbol{Y = (2/5)\,e^{2x}}$$

The anwser is 2

Problem 4. Solve the initial value problem $y'' - 2y' + y = 0$, $y(0) = 0$, $y'(0) = 1$

(1) $y = e^x(1 - x)$ (2) $y = e^x(c_1x + c_2)$ (3) $y = e^{2x}(3x + 1)$

(4) $y = e^{2x}(\cos x - 2\sin x)$ (5) $y = xe^x$

Characteristic equation is $k^2 - 2k + 1 = (k - 1)^2$. Double root $k = 1$.

General solution is $y = e^x(c_1x + c_2)$; $y' = e^x(c_1x + c_2) + c_1e^x = e^x(c_1x + c_1 + c_2)$

$y(0) = c_2 = 0$

$y'(0) = c_1 + c_2 = 1 \Rightarrow c_1 = 1$

The initial value problem is $\boldsymbol{y = xe^x}$

The answer is (5)