Math 3280 Practice Midterm 2

The test will primarily cover chapters 4, and 5, although some material from earlier chapters might be involved (determinants in chapter 3.6 for example). The actual midterm will have 3 or 4 required questions. One sheet of notes and a calculator are allowed - however you must indicate the use of a calculator, and you must show the steps in your calculations for full credit.

(1) Express $w = (7, -6, 14, 0)$ as a linear combination of $v_1 = (2, 3, 4, 0)$ and $v_2 = (-1, 4, -2, 0)$, or show that it is impossible to do so.

(2) Find the general solution to the ODE: $y^{(3)} - 5y'' + 12y' - 8y = 0$.

(3) Find the solution to the initial value problem $y'' - 2y' + 5y = e^{2x}$, $y'(0) = 0$, $y(0) = -1$.

(4) Write down the form of a particular solution y_p of the ODE $y'' + y = x^2 e^x + \cos(x)$. You do not have to determine the coefficients of the functions.

(5) If an $n \times n$ matrix A has the property that $A^3 = 2A$, what are the possible values of the determinant of A?

(6) Find a basis for the subspace defined by the following equations for $(x_1, x_2, x_3, x_4) \in \mathbb{R}^4$:

$$-3x_1 - 3x_2 + 2x_3 - 2x_4 = 0$$
$$x_1 - 3x_2 - 4x_3 = 0$$
$$7x_1 + 15x_2 + 2x_3 + 6x_4 = 0$$

(7) Solve the initial value problem $y''' - 27y = e^{3x}$, $y(0) = y'(0) = y''(0) = 0$.