

3450:335 Ordinary Differential Equations, Kreider

Typical types of Exam 3 problems

1. Standard Partial Fractions

$$y'' + 10y' + 9y = 1 \text{ with } y(0) = 2, y'(0) = 3.$$

2. Complete the square

$$y'' + 6y' + 57y = 0 \text{ with } y(0) = 1, y'(0) = 2.$$

3. Duplication in y_p (formulas 22, 25)

$$y'' + 4y = \cos 2t \text{ with } y(0) = 7, y'(0) = 0.$$

4. Integral formula

$y'' + y = 1$ with $y(0) = 2$, $y'(0) = 1$. This one uses the integral formula at the end (alternative to partial fractions) – it's optional

$y' + 6 \int_0^t y(\tau) d\tau = 2$ with $y(0) = 1$. Here, you need the integral formula at the beginning.

5. Heaviside function (unit step function)

$$y' + y = tU(t - 3) \text{ with } y(0) = 2345$$

6. Delta function

$$y'' + 4y' + 4y = \delta(t - 72) \text{ with } y(0) = 1, y'(0) = 0$$

7. Systems

$$x' = 5x - 3y$$

$$y' = 2x + y$$

with $x(0) = -2$, $y(0) = 3$