The exam will cover sections 4.2, 4.3, 4.4, 4.5, and 4.6. All topics from this review sheet or from the suggested exercises are fair game.

1 Solve the following initial value problems.

a. $y'' - 4y' + 8y = 0$; $y(0) = 1$; $y'(0) = 0$.

b. $y'' + 2y' - 3y = 0$; $y(0) = 9$; $y'(0) = -3$.

c. $y'' - 4y = 0$; $y(0) = 2$; $y'(0) = -98$.

2 What form of particular solution y_p would you guess in order to solve the following differential equations using the method of undetermined coefficients? *Do not solve these problems.*

a. $y'' - 4y' - 21y = 2e^{7t}$.

b. $y'' - 2y' - 8y = 19t\cos(2t)$.

c. $y'' - 4y' + 5y = 7e^{2t}\sin t + t$.

3 Solve the following differential equations.

a. $y'' + 4y = \tan 2t$.

b. $y''' - 2y'' + 17y' = e^{3t}$.

c. $y'' - 4y' + 4y = te^{2t}$.

4 Solve the following initial value problems.

a. $y'' - 9y = 18t$; $y(0) = 1$; $y'(0) = 11$.

b. $y'' - y' - 2y = 2e^{-t} + 4$; $y(0) = 10$; $y'(0) = -3$.

5 Suppose that you know that the general solution to the homogeneous differential equation

$$t^2y'' - 3ty' + 4y = 0$$

for $t > 0$ is

$$y_h = Ct^2 + Dt^2\ln t.$$

Find the general solution to the differential equation

$$t^2y'' - 3ty' + 4y = t^2\ln t.$$