MAP 2302

SECOND EXAM (SAMPLE)

TIME ALLOWED: 55 MINUTES

1. Solve the initial value problems

(a)

$$y'' + 2y' + 17y = 0, \qquad y(0) = 1, y'(0) = -1.$$

(b)

$$y'' - 4y' + 4y = 0, \qquad y(1) = 1, y'(1) = 1.$$

Click for a hint

2. Find the general solution of the equation

$$y'' + 4y = \tan 2x.$$

Click for a hint

3. Find the general solution of the equation

$$y'' - 4y' - 5y = 2e^{-x}.$$

Click for a hint

4. Given that $f(x) = e^x$ is a solution of the equation

$$xy'' - (x+1)y' + y = 0, \qquad x > 0,$$

find a second linearly independent solution.

Click for a hint

Hints for Q1. In (a) there are complex roots $a + ib$. Remember what $e^{a+ib}x$ means. In (b) the root is repeated, so e^{rx} does not give two fundamental solutions.
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Hints for Q2. Use variation of parameters.
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Hints for Q3. Use method of undetermined coefficients. It would be wise to solve the homogeneous equation first.
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Hints for Q4. Reduction of order!
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