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**HOMEWORK DAY 12** – *Characteristic eqn. Real roots (distinct and repeated) §2.2.1, 2.2.2*

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1. In each of these problems, find the general solution of the given differential equation

(a)  $x'' + 2x' - 3x = 0$

(b)  $6x'' - x' - x = 0$

(c)  $x'' + 5x' = 0$

(d)  $x'' - 9x' + 9x = 0$

2. Find the solution of the given initial value problem. Sketch the graph of the solution and describe its behaviour as  $t$  increases.

(a) Logan, p90, # 3

(b)  $x'' + 4x' + 3x = 0$  ,  $x(0) = 2$  ,  $x'(0) = -1$

(c)  $4x'' - x = 0$  ,  $x(0) = 1$  ,  $x'(0) = -1$

(d)  $6x'' - 5x' + x = 0$  ,  $x(0) = 4$  ,  $x'(0) = 4$

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**HOMEWORK DAY 13** – *Repeated Roots. Complex numbers.*

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3. Solve the following initial value problem and sketch a graph of the solution.

(a)  $x'' + 4x' + 4x = 0$  ,  $x(0) = 2$  ,  $x'(0) = 1$

(b)  $9y'' - 12y' + 4y = 0$  ,  $y(0) = 2$  ,  $y'(0) = -1$

4. p90: 4.

5. p90: 6.

6. p90: 7.

7. Use Euler's formula to write the given expression in the form  $a + ib$ :

(a)  $e^{1+2i}$

(b)  $e^{2-3i}$

(c)  $e^{i\pi}$

(d)  $e^{2-(\pi/2)i}$

8. Using Euler's formula, show that

(a)  $\cos t = (e^{it} + e^{-it})/2$

(b)  $\sin t = (e^{it} - e^{-it})/(2i)$  .

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**HOMEWORK DAY 14** – *Complex roots. §2.2.3*

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9. p94: 1a

p94: 1b

p94: 1c

p94: 1d

p94: 1e

p94: 1f

10. Solve the following initial value problems.

(a)  $x'' + 4x = 0$  ,  $x(0) = 0$  ,  $x'(0) = 1$

(b)  $x'' + 4x' + 5x = 0$  ,  $x(0) = 1$  ,  $x'(0) = 0$

(c)  $y'' - y' + 9.25y = 0$  ,  $y(0) = 3$  ,  $y'(0) = 1$

11. p94: 3

12. p94: 5