Math 3D Practice for the Final (2017)

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Problem 1

Review past quizzes / midterms / homework solutions on the discussion website for material prior to Chapter 2. [Also review them for the material after Chapter 2, too.]
****Especially the Quizzes!****

Problem 2 (Ch 2.5)

(a) General solution to $mx'' + cx' + kx = 0$ where $m = 3\ kg,\ c = 4\ kg/s,\ k = 1\ N/m$.
(b) Classify the damping.
(c) Reduce the order of the equation and solve the system using the Eigenvalue method.

Problem 3 (Ch 3.4)

General solution to the system $\vec{x}\,' = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & -1 \\ -2 & 0 & -1 \end{bmatrix} \vec{x}$.

Problem 3 and 1/2

Review Exercises 3.3 # 3-5 in Homework 5 on Linear Independence of Vector Valued Functions.
Reminder: 3.3.5 was a graded homework problem and 3.3.4 was one we may have done in discussion.

Problem 4 (Ch 3.7,8)

Exact solution to $\vec{x}\,' = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix} \vec{x}$, with initial condition $\vec{x}(1) = \begin{bmatrix} 1 \\ 1 \end{bmatrix} e$ using matrix exponent.
Check your answer by using methods in 3.7.

Problem 5 (Ch 6.1,2)

Solve $y'' + y = te^t$ with $y(0) = y'(0) = 0$ by using Laplace transform.

Problem 6 (Ch 6.2,3)

(This is Exercise 6.3.9) Solve $x'' - 2x = e^{-t^2}$ with $x(0) = 0,\ x'(0) = 0$.
Leave the answer as a definite integral. Hint: Use a convolution in the inverse Laplace transform.