MA 341H-040 Test 2 Review Questions

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1. Homogeneous 2nd order linear equations with constant coefficients: Sec. 4.2 problems 4, 16; sec. 4.3, problems 14, 24.
2. Undetermined coefficients: Sec. 4.4 problems 18 and 32, Sec. 4.5 problems 18 and 28.
3. Variation of parameters: Sec. 4.6 problem 18.
4. Mass-spring systems: Sec. 4.8 problem 2.
5. Definition of Laplace transform: Sec. 7.2 problem 4.
6. Laplace transforms from tables: Sec. 7.3 problems 6 and 10.
7. Inverse Laplace transforms: Sec. 7.4 problems 24 and 26.
8. Solving initial value problems: Sec. 7.5 problem 10.
9. Transforms of discontinuous functions: Sec. 7.6 problem 32.
10. Transforms of delta functions: Use last homework assignment.

Answers:

1. 4.2 problem 4: $c_1e^{-3t} + c_2te^{-3t}$
2. 4.2 problem 16: $\frac{4}{3}e^t - \frac{1}{3}e^{3t}$
3. 4.3 problem 14: $c_1e^t \cos 5t + c_2e^t \sin 5t$
4. 4.3 problem 24: $\frac{1}{3}\sin 3t + \cos 3t$
5. 4.4 problem 18: $y_p = -2t\cos 2t$
6. 4.4 problem 32: $t(At^6 + Bt^5 + Ct^4 + Dt^3 + Et^2 + Ft + G)e^{-3t}$
7. 4.5 problem 18: $c_1e^{3t} + c_2e^{-t} - t^2 + \frac{4t}{3} + \frac{1}{9}$
8. 4.5 problem 28: $\frac{e^{-4t}}{60} + \frac{1}{12} - \frac{e^t}{10} - \frac{e^{2t}}{6} + \frac{7e^{3t}}{6}$
9. 4.6 problem 18: $c_1e^{3t} + c_2te^{3t} + \frac{e^{3t}}{2t}$
10. 4.8 problem 2: $y = -\frac{1}{4}\cos 5t - \frac{1}{5}\sin 5t = \frac{\sqrt{41}}{20}\sin(5t + \phi)$ where $\phi = \arctan(\frac{5}{4}) - \pi = -2.246$.

    amplitude $= \frac{\sqrt{41}}{20}$, period $= \frac{2\pi}{5}$, frequency $= \frac{5}{2\pi}$, passes through equilibrium at $t = \frac{\pi - \arctan(\frac{5}{4})}{5} = 0.449$ seconds.
11. 7.2 problem 4: $\frac{1}{(s-3)^2}$, $s > 3$.
12. 7.3 problem 6: $\frac{2}{(s+2)^2+4} + \frac{2}{(s-3)^3}$
13. 7.3 problem 10: $\frac{(s-2)^2-25}{((s-2)^2+25)^2}$
14. 7.4 problem 24: $5e^t + 2e^{2t}\cos 3t - 5e^{2t}\sin 3t$
15. 7.4 problem 26: $1 - \frac{3}{2}t^2 + 6e^{2t}$
16. 7.5 problem 10: $-t - e^{-2t} + 2te^{-2t} + e^{2t}$
17. 7.6 problem 32: $\cos t - \sin 2t - (2\sin t)u(t - 2\pi) + (\sin 2t)u(t - 2\pi)$