

MA 341-005 Test 2 Review Questions

S. Schecter

March 16, 2005

1. Undetermined coefficients: Sec. 4.4 problems 18 and 32, Sec. 4.5 problems 18 and 28.
2. Variation of parameters: Sec. 4.6 problem 18.
3. Mass-spring systems: Sec. 4.8 problem 2.
4. Laplace transforms: Sec. 7.3 problems 6 and 10.
5. Inverse Laplace transforms: Sec. 7.4 problems 24 and 26.
6. Solving initial value problems: Sec. 7.5 problem 11.
7. Transforms of discontinuous and periodic functions: Sec. 7.6 problems 28 ($y = \sin t$ for $0 < t < \pi$), 32.

Answers:

1. 4.4 problem 18: $y_p = -2t \cos 2t$

4.4 problem 32: $t(At^6 + Bt^5 + Ct^4 + Dt^3 + Et^2 + Ft + G)e^{-3t}$

4.5 problem 18: $c_1e^{3t} + c_2e^{-t} - t^2 + \frac{4t}{3} + \frac{1}{9}$

4.5 problem 28: $\frac{e^{-4t}}{60} + \frac{1}{12} - \frac{e^t}{10} - \frac{e^{2t}}{6} + \frac{7e^{3t}}{6}$

2. 4.6 problem 18: $c_1e^{3t} + c_2te^{3t} + \frac{e^{3t}}{2t}$

3. 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.

4. 7.3 problem 6: $\frac{2}{(s+2)^2+4} + \frac{2}{(s-3)^3}$

7.3 problem 10: $\frac{(s-2)^2-25}{((s-2)^2+25)^2}$

5. 7.4 problem 24: $5e^t + 2e^{2t} \cos 3t - 5e^{2t} \sin 3t$

7.4 problem 26: $1 - \frac{3}{2}t^2 + 6e^{2t}$

6. 7.5 problem 11: see text.

7. 7.6 problem 28: $\frac{1}{(1-e^{-\pi s})(s^2+1)}$

7.6 problem 32: $\cos t - \sin 2t - (2 \sin t)u(t - 2\pi) + (\sin 2t)u(t - 2\pi)$