

Math 217 - October 5, 2010

Solutions

- Mechanical vibrations
 - Nonhomogeneous equations
1. What is the cosine addition formula? $\cos(a - b) = \cos a \cos b - \sin a \sin b$
 2. Determine if the mechanical systems modeled below are undamped, underdamped, critically damped or over damped.
 - (a) $3x'' + 4x' + 8x = 0$
 - (b) $3x'' + 6x' + 8x = 0$
 - (c) $10x'' + 6x' + 8x = 0$
 - (d) $10x'' + 6x' + 9x = 0$
 3. Determine if the mechanical systems modeled below are undamped, underdamped, critically damped or over damped.
 - (a) $mx'' + cx' + kx = 0$
 - (b) $x'' + 2px' + \omega_0 x = 0$

Lecture Problems

4. Write each of the solutions below as $C \cos(\omega_0 t - \alpha)$ for some values of C, ω_0 and α .
 - (a) $3 \cos 5t + 3\sqrt{3} \sin 5t = 6 \cos(5t - \pi/3)$
 - (b) $-2 \cos 13t - 2\sqrt{3} \sin 13t = 4 \cos(13t - 4\pi/3)$
 - (c) $13 \cos 7t + 6 \sin 7t =$
 - (d) $13 \cos 7t - 6 \sin 7t =$
 - (e) $-13 \cos 7t + 6 \sin 7t =$
 - (f) $-13 \cos 7t - 6 \sin 7t =$
5. For each of the equations, determine the best guess for y_p (method of undetermined coefficients) and find y_p .
 - (a) $y'' - 3y' + y = -3e^{2x}$
 - (b) $y'' + 2y' + 3y = \cos 3x$
 - (c) $y'' + 6y' - 2y = 3x^4 - x$
 - (d) $3y''' + y' - 2y = \sin x + 3e^{-2x}$
6. For each of the equations, determine the best guess for y_p (method of undetermined coefficients) and find y_p .

(a) $y'' - 3y' + 2y = 3e^x$

(b) $y'' - 3y' + 2y = 3e^{2x}$

(c) $y''' - 3y'' + 2y' = 6x^2$

7. For each of the equations, determine the best guess for y_p (method of undetermined coefficients) and find y_p .

(a) $y''' - y'' - 6y' = \sin 3x + 4 \cos 2x$

(b) $y''' - y'' - 6y' = x^2 + 5xe^{3x} - 2e^{-2x}$