Math 211 Fall 2007: Solutions: HW #5
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1. section 4.4, #12
   This problem is modeled by \( x'' + 36x = 0 \).
   The general solution is \( C_1 \cos(6t) + C_2 \sin(6t) \).
   \( C_1 = 0 \) and \( C_2 = \frac{4}{6} \)
   Period: \( \frac{2 \pi}{6} \) Amplitude: \( \frac{4}{6} \) Phase angle: \( \frac{\pi}{2} \)

2. section 4.4, #16
   The general solution to \( mx'' + kx = 0 \) is \( C_1 \cos(\sqrt{\frac{k}{m}}) + C_2 \sin(\sqrt{\frac{k}{m}}) \)
   \( C_1 = x_0 \) and \( C_2 = v_0 \sqrt{\frac{m}{k}} \)
   So the amplitude is \( \sqrt{x_0^2 + v_0^2 \frac{m}{k}} \).

3. section 4.5, #2
   Note that \( e^{-t} \) is not a solution to the homogeneous differential equation.
   Try \( y = ae^{-t} \). This gives \( ae^{-t}(1 - 6 + 8) = -3e^{-t} \).
   \( a = -1 \) and a solution is \( -e^{-t} \)

4. section 4.5, #4
   Note that \( e^{2t} \) is not a solution to the homogeneous differential equation.
   Try \( y = ae^{2t} \). This gives \( ae^{2t}(4 + 6 - 18) = 18e^{2t} \).
   \( a = -\frac{9}{4} \) and a solution is \( -\frac{9}{4}e^{2t} \)

5. section 4.5, #6 Note that \( \sin(2t) \) and \( \cos(2t) \) are not solutions to the homogeneous differential equation.
   Try \( y = a \cos(2t) + b \sin(2t) \). This gives \( -4a \cos(2t) - 4b \sin(2t) + 9a \cos(2t) + 9b \sin(2t) = \sin(2t) \).
   \( a = 0 \) and \( b = \frac{1}{5} \). A particular solution is \( \frac{\sin(2t)}{5} \).