Solutions to Midterm II

1) $$y(x) = \frac{\cos 2x}{4}\log(\cos 2x) + \frac{x \sin 2x}{2} + A\cos 2x + B\sin 2x.$$

2) Linearly Independent

3 a) $$X(t) = -16 + \frac{2(2-\omega^2)\cos \omega t + 4\omega \sin \omega t}{(2\omega)^2 + (2-\omega^2)^2}$$

3 b) There are no values of ω for which resonance occurs.

4) Let θ_n be the positive angles for which $\tan \theta_n = \theta_n$. Then the eigenvalues are

$\lambda = 1$ and $\lambda = \theta_n^2 + 1$, $n = 1, 2, 3, \ldots$