

Exercise 5.1

12. Solution: $t = -\frac{7\pi}{18} + \frac{2n\pi}{3}$, and $t = -\frac{\pi}{2} + \frac{2n\pi}{3}$, for $n = 1, 2, 3, \dots$

27. Solution: (a) $x = \frac{4}{3}e^{-2t} - \frac{1}{3}e^{-8t}$. (b) $x = -\frac{2}{3}e^{-2t} - \frac{5}{3}e^{-8t}$.

31. Solution: (a) $\beta > 5/2$. (b) $\beta = 5/2$. (c) $0 < \beta < 5/2$.

43. Hint: (a) $x_p = (F_0 \cos \gamma t)/(\omega^2 - \gamma^2)$. (b) Use L'Hopital's rule.

Solution: (b) The limit is $(F_0/2\omega)t \sin \omega t$.

Exercise 5.2

11. Solution: The eigenvalues are $\lambda = (2n - 1)^2 \pi^2 / 4L^2$, corresponding to the eigenfunctions $\cos \frac{(2n-1)\pi}{2L} x$, for $n = 1, 2, 3, \dots$

16. Solution: The eigenvalues are $\lambda = n^2 \pi^2 - 1$, corresponding to the eigenfunctions $\cos(n\pi x)$, for $n = 0, 1, 2, \dots$