

Problem 15

Suppose that a certain population satisfies the initial value problem

$$dy/dt = r(t)y - k, \quad y(0) = y_0,$$

where the growth rate $r(t)$ is given by $r(t) = (1 + \sin t)/5$, and k represents the rate of predation.

- (a) Suppose that $k = 1/5$. Plot y versus t for several values of y_0 between $1/2$ and 1 .
- (b) Estimate the critical initial population y_c below which the population will become extinct.
- (c) Choose other values of k and find the corresponding y_c for each one.
- (d) Use the data you have found in parts (b) and (c) to plot y_c versus k .