

Exercise 26

A variable star is one whose brightness alternately increases and decreases. For the most visible variable star, Delta Cephei, the time between periods of maximum brightness is 5.4 days, the average brightness (or magnitude) of the star is 4.0, and its brightness varies by ± 0.35 magnitude. Find a function that models the brightness of Delta Cephei as a function of time.

Solution

Since the brightness alternately increases and decreases, a sinusoidal function will be used to model it. Either sine or cosine will do.

$$\sin t$$

Since the period is known to be 5.4 days, the coefficient of t is $2\pi/5.4$.

$$\sin \frac{2\pi}{5.4}t$$

The average brightness of the star is 4.0, so add 4.0 to this function to vertically shift it up by 4.0 units.

$$\sin \frac{2\pi}{5.4}t + 4.0$$

The amplitude of oscillation is 0.35, so this is the coefficient of sine.

$$0.35 \sin \frac{2\pi}{5.4}t + 4.0$$

