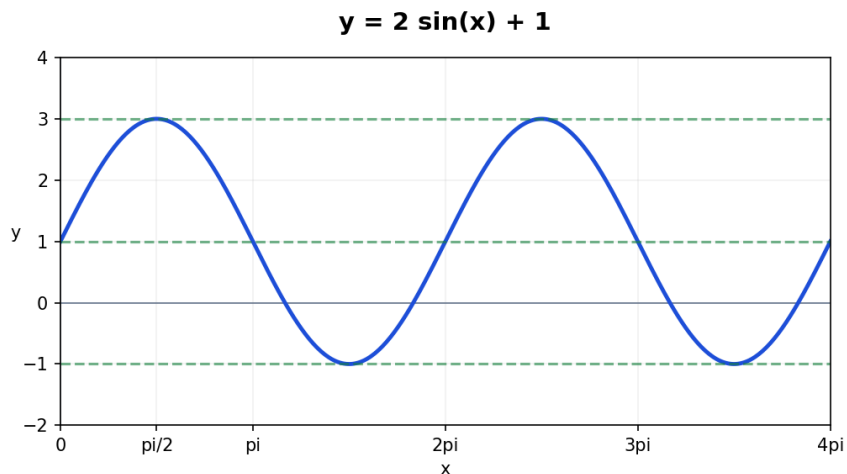


Solutions

6.1 Amplitude, Period, and Midline

6.1.1. For $y = 2\sin x + 1$, find amplitude, period, midline, and range.

Solution. Amplitude 2, period 2π , midline $y = 1$, and range $[-1, 3]$.



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Amplitude = 2, midline = 1, period = 2π , range $[-1, 3]$.

6.1.2. Find the period of $y = -4\cos(3x)$.

Solution. The period is $2\pi/3$. The negative sign reflects the graph but does not change the period.

6.1.3. A sine model has period 8. Find a positive frequency coefficient.

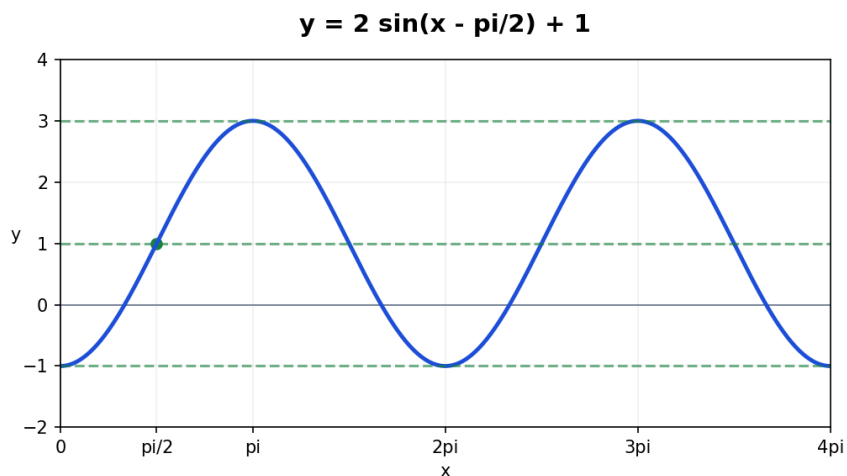
Solution. $B = 2\pi/8 = \pi/4$.

Solutions

6.2 Phase Shift

6.2.1. For $y = 2\sin(x - \pi/2) + 1$, find the shift and the value at $x = \pi/2$.

Solution. The shift is right $\pi/2$. The value is $2\sin 0 + 1 = 1$.



The highlighted midline crossing is $(\pi/2, 1)$.

6.2.2. Factor the argument and find the shift of $y = \cos(3x + \pi)$.

Solution. It is $\cos(3(x + \pi/3))$, shifted left $\pi/3$.

6.2.3. Write a sine function of amplitude 1, period 2π , shifted right $\pi/3$.

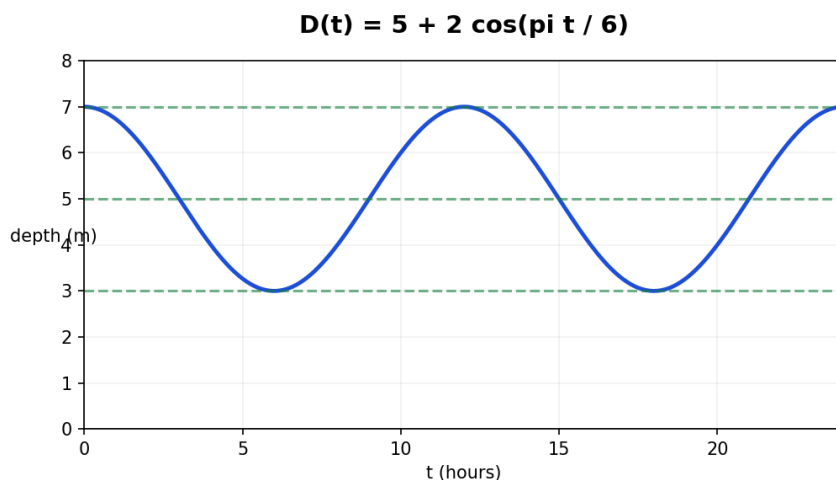
Solution. One answer is $y = \sin(x - \pi/3)$.

Solutions

6.3 Modelling Periodic Situations

6.3.1. Water depth is $D(t) = 5 + 2\cos(\pi t/6)$ meters with t in hours. Find maximum, minimum, and repeat time.

Solution. The maximum is 7 m, minimum 3 m, and period $2\pi/(\pi/6) = 12$ hours.



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Maximum depth = 7 m, minimum = 3 m, period = 12 h.

6.3.2. For the depth model, find depth at $t = 3$ and $t = 6$ hours.

Solution. $D(3) = 5 + 2\cos(\pi/2) = 5$ m; $D(6) = 5 + 2\cos \pi = 3$ m.

6.3.3. A temperature cycles from 12 to 28 degrees every 24 hours and is maximal at $t = 0$. Give a model.

Solution. $T(t) = 20 + 8\cos(\pi t/12)$, with t in hours.