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$A \Rightarrow a$

middle = k

period = b

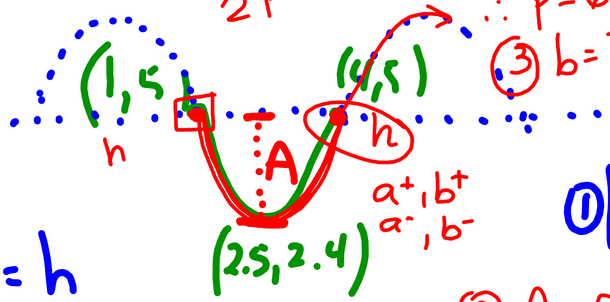
point on middle axis = h

$\frac{1}{2}$ cycle

$\frac{1}{2}$ period $(4-1) = 3$

$\therefore p = 6$

③ $b = \pm\frac{2\pi}{6} = \pm\pi/3$



① $k = 5$

② $A = 5 - 2.4$
$= 2.6$

$a = \pm 2.6$

$y = 2.6\sin\left(\pi/3(x-4)\right) + 5$

let $x = 6$

$y = 2.6\sin\left(\pi/3(2)\right) + 5$

$= 2.6\sin\left(\frac{2\pi}{3}\right) + 5$

$= 2.6\left(\frac{\sqrt{3}}{2}\right) + 5 = 7.25\text{dm}$

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20 A lawn aerator is a mechanical device with cylindrical blades that extract small earth plugs from the soil and improve the soil's ability to provide for the lawn's needs. On the aerator shown in the adjacent picture, the distance d (in cm) between the end of a cylindrical blade and the surface of the soil varies according to the rule $d = -3.5 \sin \frac{\pi}{3} x + 1.5$ where x represents the horizontal distance (in cm) travelled by the aerator.

a) What is the depth of the aerating holes made by this blade?

b) What is the distance between two consecutive aerating holes made by this blade?

a) min $k - A = 1.5 - 3.5 = -2$ 2cm

b) $0 = -3.5 \sin \frac{\pi}{3} x + 1.5$

b) $0 = -3.5\sin\frac{\pi}{3}x + 1.5$

$-1.5 = -3.5\sin\frac{\pi}{3}x$

$\frac{3}{7} = \sin\frac{\pi}{3}x$

$0.\overline{428571} = \sin\frac{\pi}{3}x$

$\sin^{-1}\left(\frac{3}{7}\right) = \frac{\pi}{3}x$

① $\frac{\pi}{3}x = 0.4429$

$x = 0.4229$ cm

② $\frac{\pi}{3}x = \pi - 0.4429 = 2.6987$

$x = 2.5771$ cm

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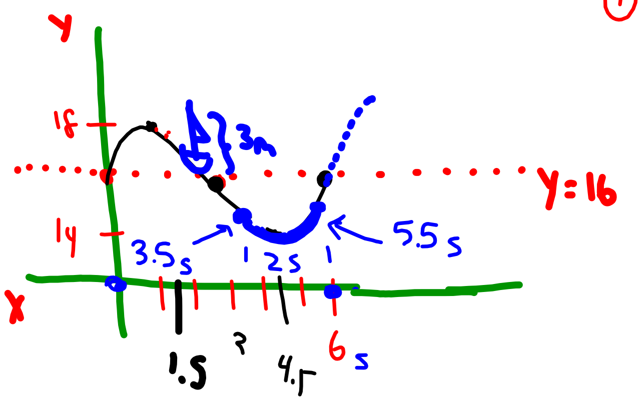
$b = \frac{\pi}{3}$ $\quad p = 2\pi \div \pi/3 = 2\pi \times \frac{3}{\pi} = 6$

18 The height h (in m) of the waterline of a sailboat anchored at sea is represented by the rule $h = 2 \sin \frac{\pi}{3}x + 16$ where x is time (in s). At certain times, the waves on either side of the sailboat are higher than the top of the mast. What is the length of time that the sailboat will be in this situation in the course of one minute if the top of the mast is 3 m above the water's surface?



① let $y = 15$

$15 = 2\sin\frac{\pi}{3}x + 16$

$-1 = 2\sin\frac{\pi}{3}x$

$-\frac{1}{2} = \sin\frac{\pi}{3}x$

$\frac{\pi}{3}x = \frac{7\pi}{6}$ or $\frac{\pi}{3}x = \frac{11\pi}{6}$

$\pi x = \frac{21\pi}{6}$ $\quad \pi x = \frac{33\pi}{6}$

$= \frac{21}{6} = 3.5$ $\quad x = \frac{33}{6} = 5.5$

1 cycle = 6 s
1 min = 60 s
$\frac{60}{6}$ = # of cycles = 10

In one minute there are 10 cycles

$10 \times 2 = 20$ sec