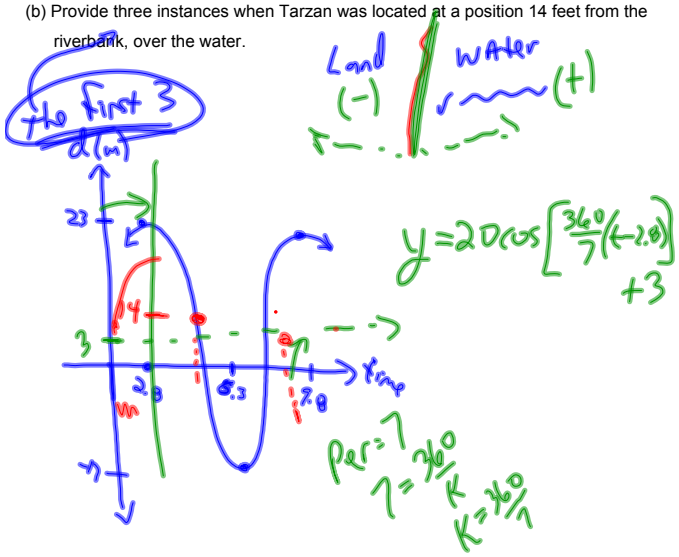
Check-Up...

Tarzan is swinging back and forth on his grapevine. As he swings, he goes back and forth across the riverbank, going alternately over land and water. Jane decides to model mathematically his motion and starts her stopwatch. Let t be the number of seconds the stopwatch reads and let y be the number of meters Tarzan is from the riverbank. Assume that y varies sinusoidally with t, and that y is positive when Tarzan is over water and negative when he is over land. Jane finds that when t = 2.8 seconds, Tarzan is at one end of his swing, 23 feet from the riverbank, over the water. She finds when t = 6.3 seconds he reaches the other end of his swing and is situated 17 feet from the riverbank, however this time over land.

(a) Where was Tarzan when Jane started the stopwatch?

(b) Provide three instances when Tarzan was located at a position 14 feet from the riverbank, over the water.



(a) $y = 20\cos\left[\frac{360}{7}(0-2.8)\right]+3$

$y = -13.2$

13.2 feet from riverbank, above land.

(b) $14 = 20\cos\left[\frac{360}{7}(t-2.8)\right]+3$

$\frac{11}{20} = \frac{20\cos\left(\frac{360}{7}(t-2.8)\right)}{20}$

$\cos^{-1}\left(\frac{11}{20}\right) = \cos^{-1}\left(\cos\left(\frac{360}{7}(t-2.8)\right)\right)$

$\cos^{-1}\left(\frac{11}{20}\right) = \frac{360}{7}(t-2.8)$

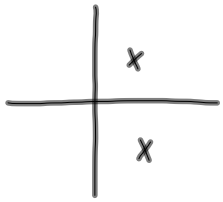
$56.63 = \frac{360}{7}(t-2.8)$

$\frac{7(56.63)}{360} + 2.8 = t$

$t = 3.9$ sec

± Period

$t = 1.7$ sec
$t = 3.901$ sec
$t = 8.7$ sec
$t = 10.901$ sec



Q4

$303.37 = \frac{360}{7}(t-2.8)$

$t = \frac{7(303.37)}{360} + 2.8$

$t = 8.7$ sec

$$17.6 = -20\sin\left[\frac{360}{18}(t-11)\right] + 8$$

Find 1st 4 values of "t". $t > 0$

$t = 3.4\text{ sec}, 9.6\text{ sec}, 21.4\text{ sec}, 27.6\text{ sec}$

$$\frac{17.6-8}{-20} = \sin\left(\frac{360}{18}(t-11)\right)$$

$$\sin^{-1}\left(-\frac{9.6}{20}\right) = \sin^{-1}\left(\sin\left(\frac{360}{18}(t-11)\right)\right)$$

$$\sin^{-1}\left(\frac{9.6}{20}\right) = \frac{360}{18}(t-11)$$

(Ref ∡ 28.69°)

"K"

Q3

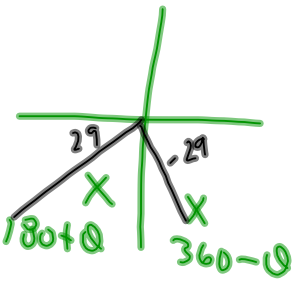
$$208.69 = \frac{360}{18}(t-11)$$

$$\frac{208.69(18)}{360} + 11 = t$$

$t = 21.4\text{ sec}$ (3rd)

-18

1st 3.4 sec



Q4

$$331.31 = \frac{360}{18}(t-11)$$

$$\frac{18(331.31)}{360} + 11 = t$$

$t = 27.565$ (4th)

$K = 360$

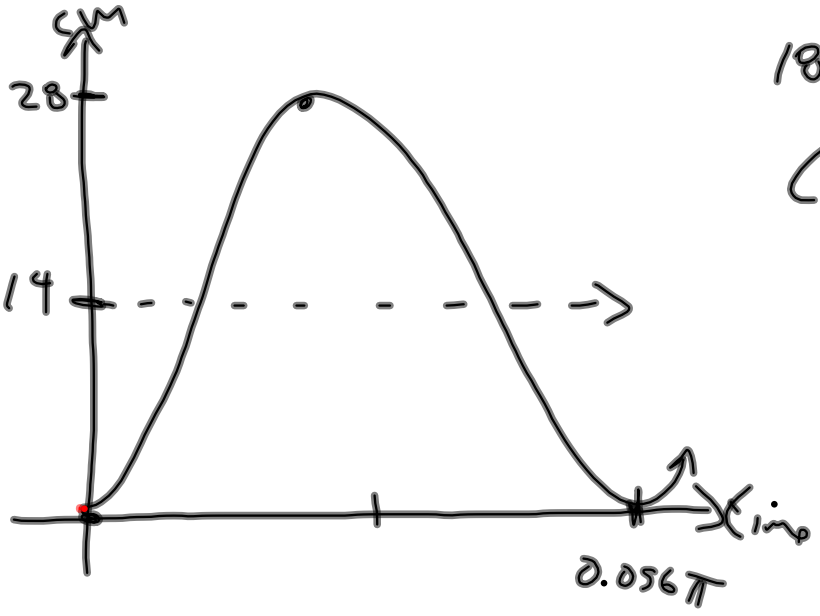
Per

$\text{Per} = 18\text{ sec}$

-18 sec

2nd 9.6 sec

#6)



$18 km/h = \frac{18}{3.6} m/s$

$C = 2\pi(14)$

$C = 28\pi cm$

$C = 0.28\pi m$

$\frac{18 Km}{h} \cdot \frac{1h}{3600s} \cdot \frac{10^3 m}{Km}$

$d = vt$

$t = \frac{d}{v}$

$t = \frac{0.28\pi m}{\frac{18}{3.6} m/s}$

$t = \frac{0.28\pi m}{5 m/s}$

$t = 0.056\pi m$

$k = \frac{2\pi}{0.056\pi}$

$k = \frac{2}{0.056}$

$y = -14\cos\left[\frac{2}{0.056}t\right] + 14$

$t = 300 sec$ Radians!!

$y = -14\cos\left[\frac{2}{0.056}(300)\right] + 14$