Name: key

$y = C + A\sin B(x - D)$

Amplitude

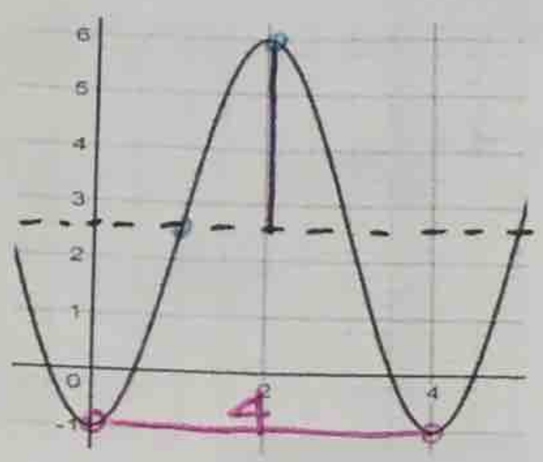
sine starts @ mid going up
cosine starts @ high
(can reflect!)

sinusoidal axis

period $= \frac{2\pi}{B}$ OR $B = \frac{2\pi}{per.}$

Unit 2 Graphing Sinusoidal Functions Review

Write the equation of the graph as both sine and cosine



1. $C = 2.5$

$A = 3.5$

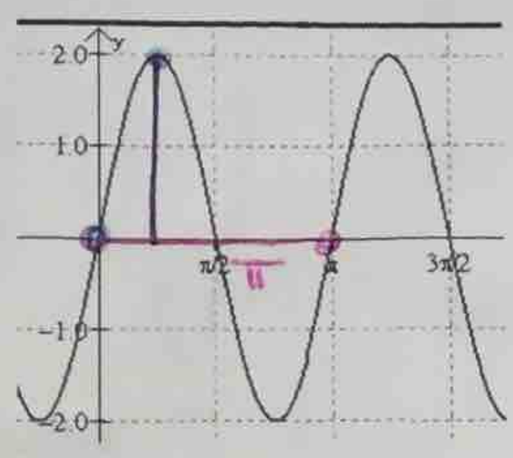
$B = \frac{2\pi}{4} = \frac{\pi}{2}$

D: cos 2
sin 1

$y = 2.5 + 3.5\sin\frac{\pi}{2}(x-1)$

$y = 2.5 + 3.5\cos\frac{\pi}{2}(x-2)$

ETC.



2. $C = 0$

$A = 2$

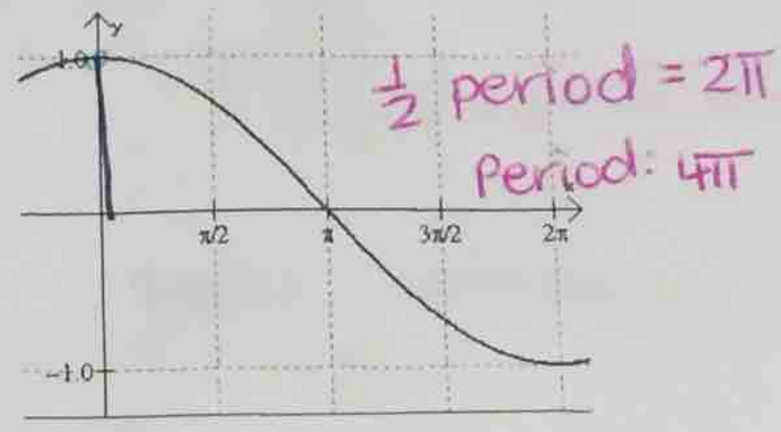
$B = \frac{2\pi}{\pi} = 2$

D: cos $\pi/4$
sin 0

$y = 2\sin 2x$

$y = 2\cos 2(x - \frac{\pi}{4})$

ETC



3. $C = 0$

$A = 1$

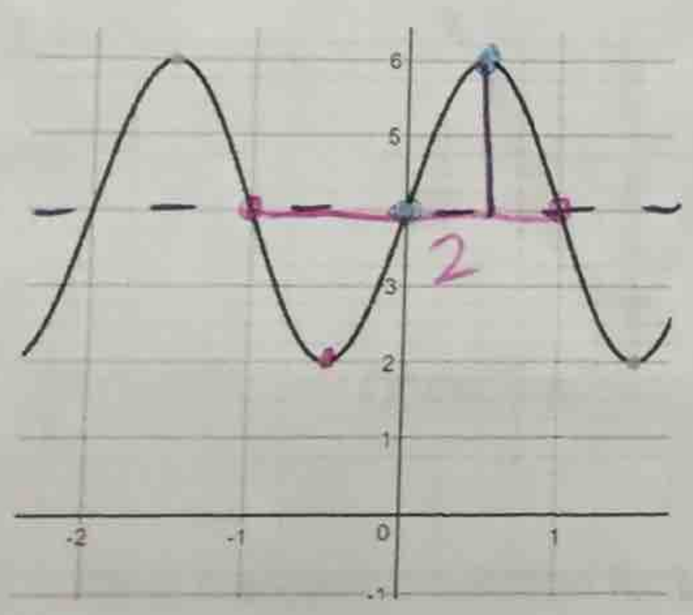
$B = \frac{2\pi}{4\pi} = \frac{1}{2}$

D: cos 0
sin $-\pi$

$y = \sin\frac{1}{2}(x + \pi)$

$y = \cos\frac{1}{2}(x)$

ETC.



4. $C = 4$

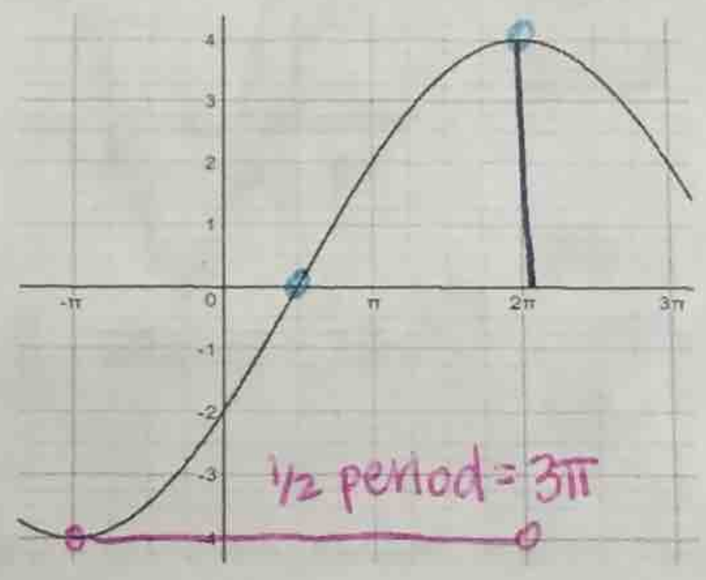
$A = 2$

$B = \frac{2\pi}{2} = \pi$

D: cos ½
sin 0

$y = 4 + 2\sin\pi x$

$y = 4 + 2\cos\pi(x - \frac{1}{2})$



5. $C = 0$

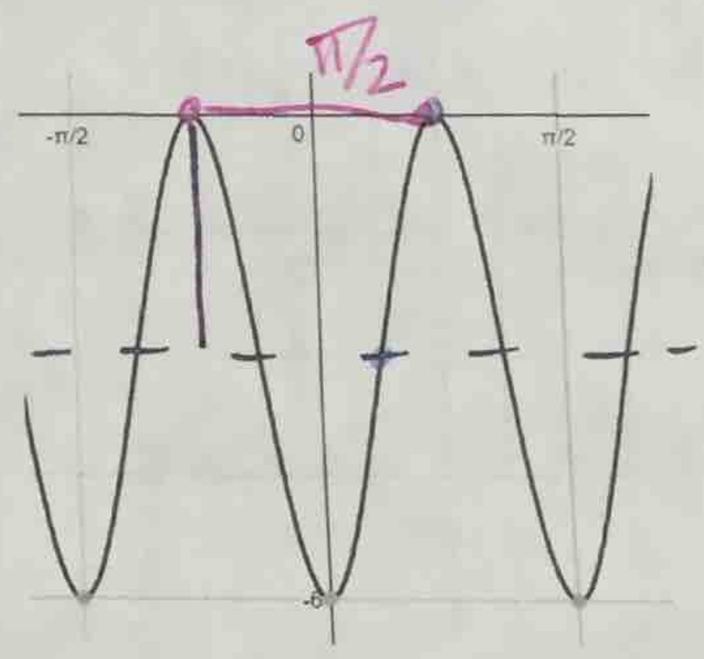
$A = 4$

$B = \frac{2\pi}{6\pi} = \frac{1}{3}$

D: cos 2π
sin $\pi/2$

$y = 4\sin\frac{1}{3}(x - \frac{\pi}{2})$

$y = 4\cos\frac{1}{3}(x - 2\pi)$



6. $C = -3$

$A = 3$

$B = \frac{2\pi}{\pi/2} = 4$

D: cos $\pi/4$
sin $\pi/8$

$y = -3 + 3\sin 4(x - \pi/8)$

$y = -3 + 3\cos 4(x - \pi/4)$

Draw 2 cycles of each graph in radians. Identify the period, amplitude, shifts, domain and range of each.

7. $y = 7\sin 4\left(x - \frac{\pi}{4}\right) - 3$

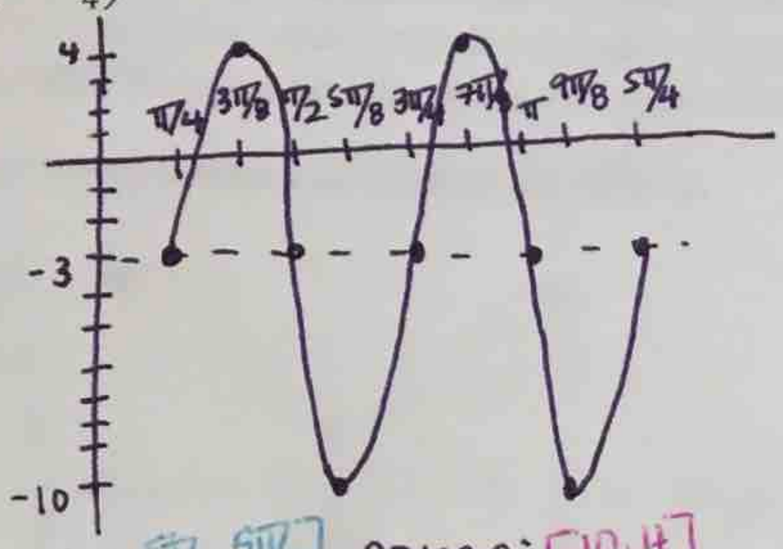
Amp: 7 (A)

Period: $\frac{2\pi}{4} = \frac{\pi}{2}$ (B)

CP: $\pi/8$

Phase Shift: $\frac{\pi}{4}$ (middle) (D)

Vert. Shift: -3 (C)



Domain: $[\pi/4, 5\pi/4]$ OR $\mathbb{R}$ Range: $[-10, 4]$

8. $y = 5 - 4\cos\frac{\pi}{5}(x+3)$ ← reflection

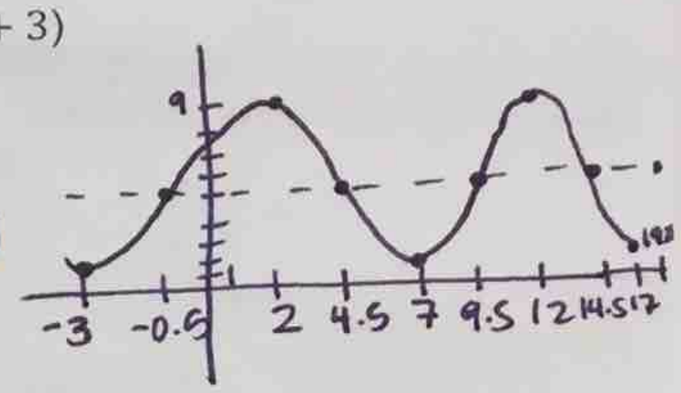
Amp: 4

Period: $\frac{2\pi}{\pi/5} = 10$

CP: $\frac{10}{4} = 2.5$

PS: -3 (low)

VS: 5



Domain: $[-3, 17]$ OR $\mathbb{R}$ Range: $[1, 9]$

9. $y = -4\cos\pi(x-3)$ ← reflection

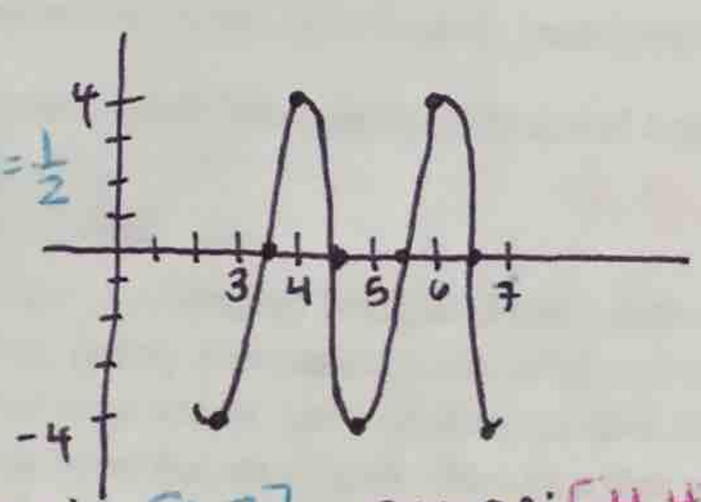
Amp: 4

Period: $\frac{2\pi}{\pi} = 2$

CP: $\frac{2}{4} = \frac{1}{2}$

PS: 3 (low)

VS: 0



Domain: $[3, 7]$ $\mathbb{R}$ Range: $[-4, 4]$

10. $y = 10\sin\left(2x + \frac{\pi}{4}\right) - 6$ $2\left(x + \frac{\pi}{8}\right)$

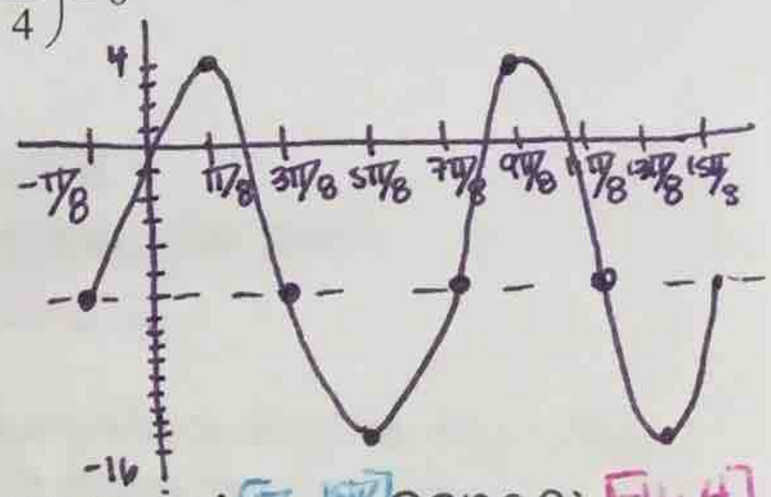
Amp: 10

Period: $\frac{2\pi}{2} = \pi$

CP: $\frac{\pi}{4}\left(\frac{2}{8}\right)$

PS: $-\frac{\pi}{8}$ (middle)

VS: -6



Domain: $[-\pi/8, 15\pi/8]$ $\mathbb{R}$ Range: $[-16, 4]$

11. $y = 3\cos(x + \pi)$

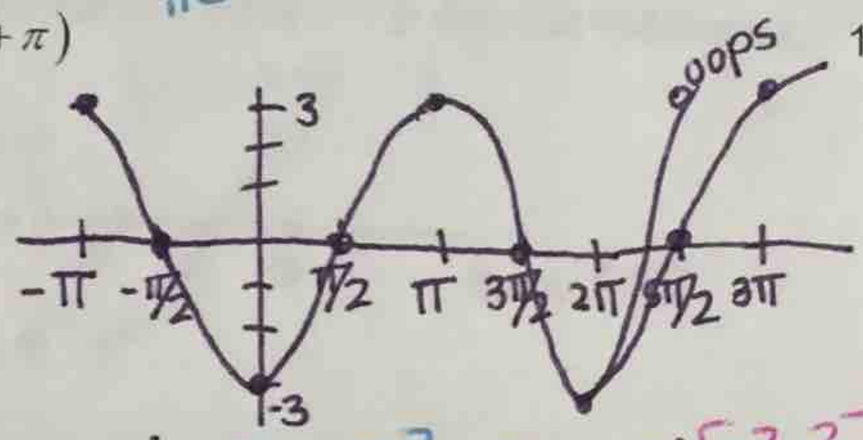
Amp: 3

Period: $\frac{2\pi}{1} = 2\pi$

CP: $\frac{\pi}{2}$

PS: $-\pi$ (high)

VS: 0



Domain: $[-\pi, 3\pi]$ $\mathbb{R}$ Range: $[-3, 3]$

12. $y = 1 - \sin(\pi x)$ ← reflection

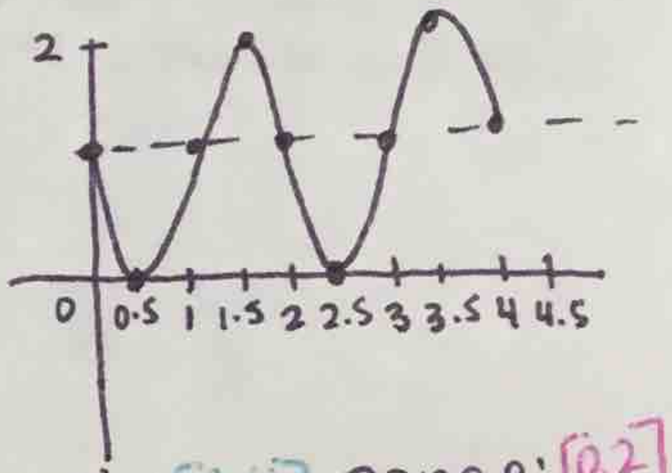
Amp: 1

Period: $\frac{2\pi}{\pi} = 2$

CP: 0.5

PS: 0 (middle)

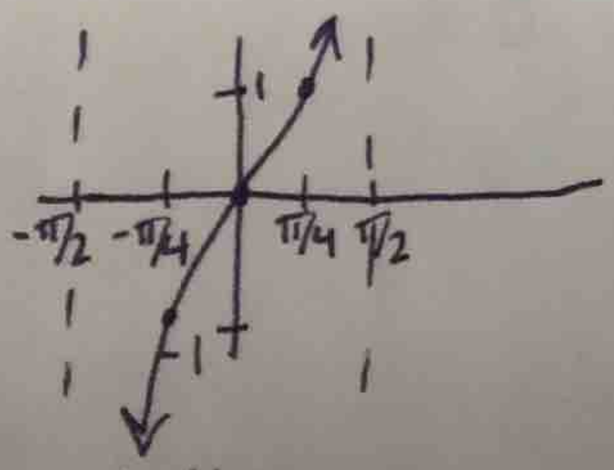
VS: 1



Domain: $[0, 4]$ $\mathbb{R}$ Range: $[0, 2]$

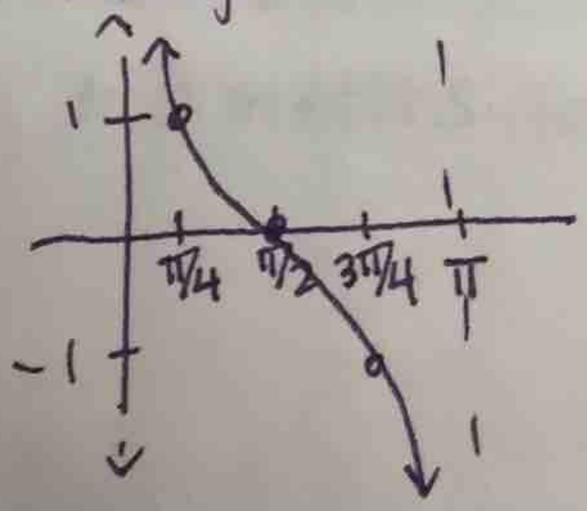
13. Draw the parent function for tangent, cotangent, secant, and cosecant

tangent



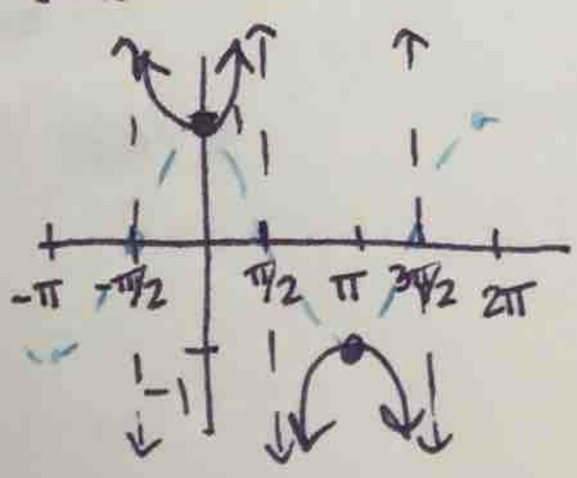
Period: π

cotangent



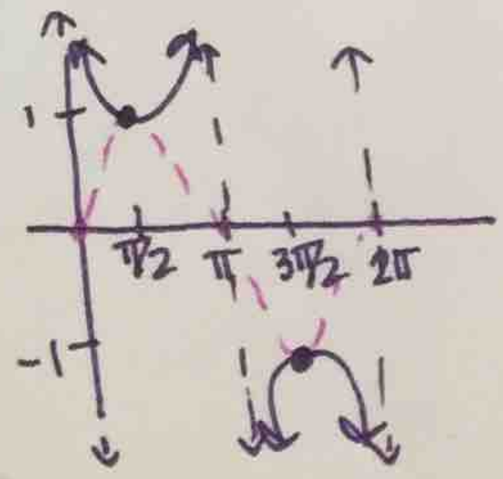
Period: π

secant $\left(\frac{1}{\cos}\right)$



Period: 2π

cosecant $\left(\frac{1}{\sin}\right)$

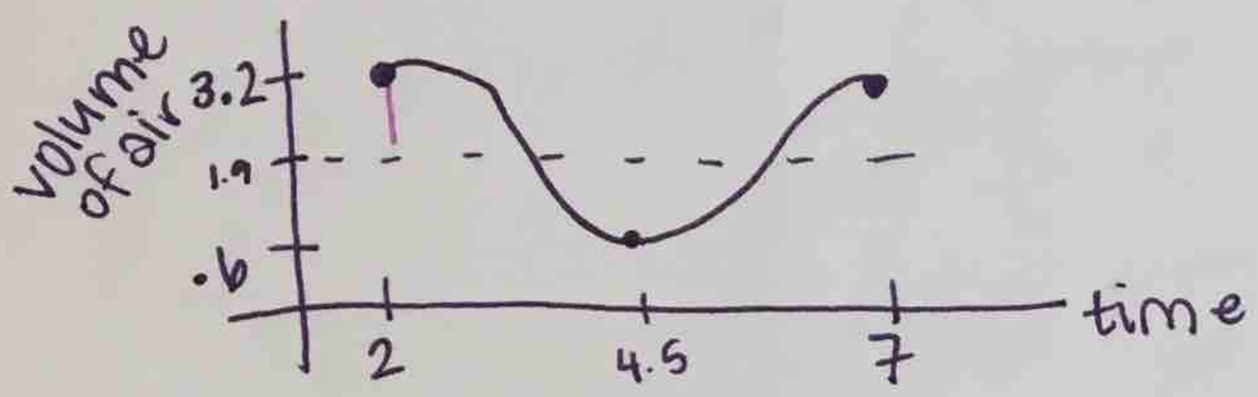


Period: 2π

14. Assume that as you breathe, the volume of air in your lungs is a sinusoidal function of time. Suppose that at time t = 2 seconds, your lungs have their maximum volume of 3.2 liters. When you exhale, your lungs still have .6 liters. Your breathing rate is one complete breath every 5 seconds.

Period

a. Draw a graph to show volume of air vs time



A: 1.3 D: cos 2 −cos 4.5

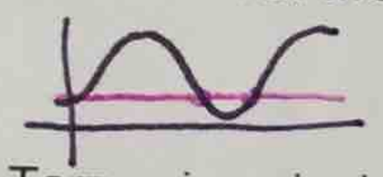
C: 1.9 B: $\frac{2\pi}{per} = \frac{2\pi}{5}$

b. Write an equation to show volume in terms of time

$y = 1.9 + 1.3 \cos \frac{2\pi}{5}(x-2)$

c. How much air did you have in your lungs at time t = 0? 0.848 liters

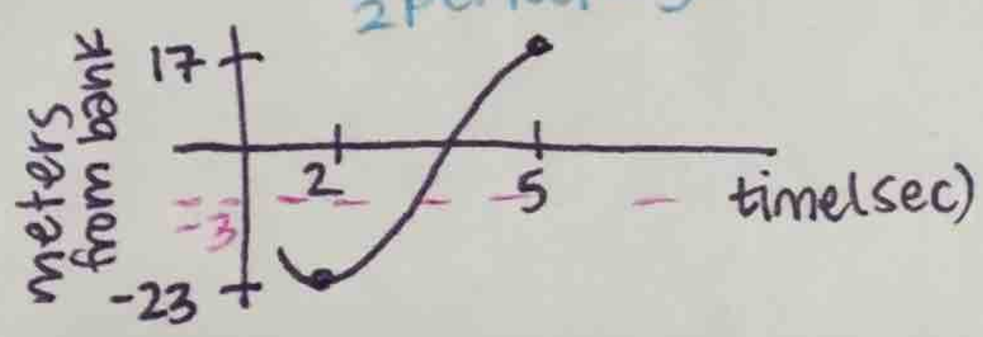
d. Between what two positive values of t did your lungs first have no more than 1 liter of air?



3.858 and 5.141 seconds

15. 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 his movement mathematically 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, Tarzan is at the end of his swing, where y = -23. She finds that when t = 5, he reaches the other end of his swing and y = 17. a. Sketch a graph of this function.

$\frac{1}{2}$ period = 3



A: $\frac{17-(-23)}{2} = 20$ D: −cos 2 cos 5

C: −3 B: $\frac{2\pi}{6} = \frac{\pi}{3}$

b. Write an equation expressing Tarzan's distance from the river bank in terms of t

$y = -3 - 20 \cos \frac{\pi}{3}(t-2)$

c. Find y when t = 2.8, t = 6.3 and t = 1.5

-16.383 1.158 -20.321

d. Where was Tarzan when Jane started her stopwatch?

x=0 +7 meters from bank