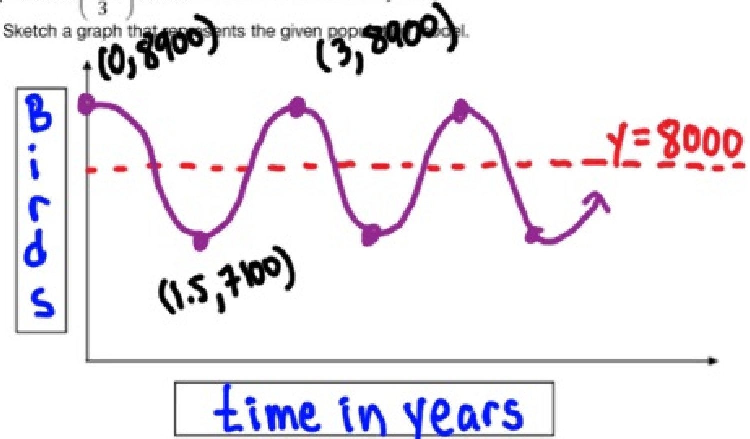
Trigonometric Graphing Applications

YOU CAN USE GRAPHING TECHNOLOGY ON ALL PARTS

In a fluctuating population of birds, the population is modeled by the function:

$f(t)=900\cos\left(\frac{2\pi}{3}t\right)+8000$ where t is measured in years.

a. Sketch a graph that represents the given population model.



b. Find the length of time between successive periods of maximum population.

3 years

c. What is the minimum population? When does this occur in the first cycle?

7100 Birds. After 1.5 years

d. What it the average amount of birds over the open-ended time period?

8000 Birds

e. After 19 years, in the population of the birds increasing or decreasing?

$f(19)=7550$. Population of Birds is increasing

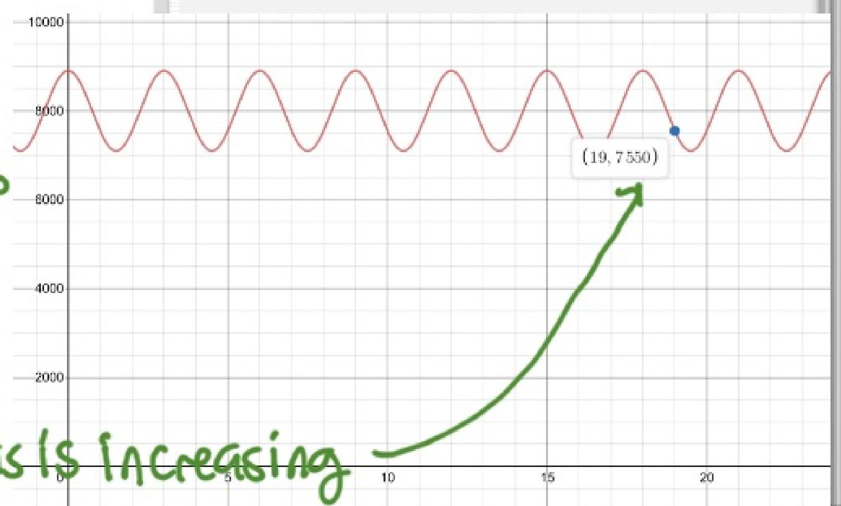
$f(t)=900\cos\left(\frac{2\pi}{3}t\right)+8000$

Amplitude: 900

period: $\frac{2\pi}{2\pi/3} \rightarrow 3$

phase shift: none

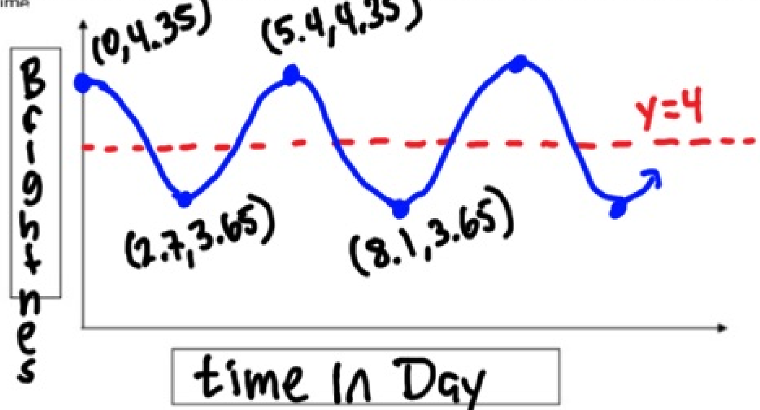
vertical shift: 8000



Trigonometric Graphing Applications

A variable star is one whose brightness alternately increases and decreases. For the variable star HAMSTAR, the time between periods of maximum brightness is 5.4 days. The average brightness of the star is 4.0, and its brightness varies by a magnitude of 0.35.

a. If the ***HAMSTAR*** is at its brightest at t = 0, sketch a graph that represents the star's brightness with respect to time.



b. Find a function that models the brightness as a function of time.

period = $\frac{2\pi}{B}$ period = 5.4

$\frac{2\pi}{B} = 5.4 \rightarrow \frac{2\pi}{5.4} \rightarrow \frac{10\pi}{27}$

trig: cos

A = 0.35   B = $10\pi/27$

C = none   D = 4

Final Build:

$\rightarrow f(t) = 0.35\cos\left(\frac{10\pi}{27}t\right) + 4$

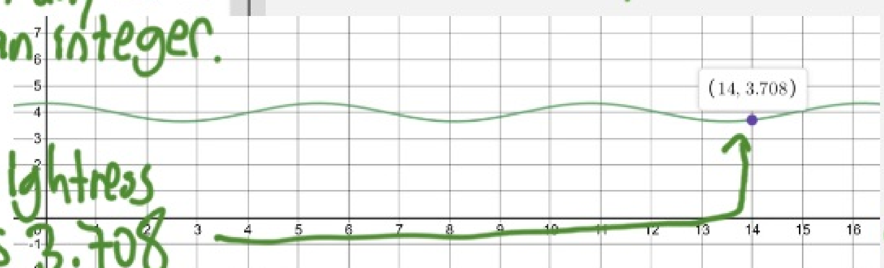
c. At what point will the star be at its dimmest? What is its magnitude?

The star will be it's dimmest 2.7 day after we start and every 5.4 thereafter.

t = 2.7 + 5.4n, where "n" is an integer.

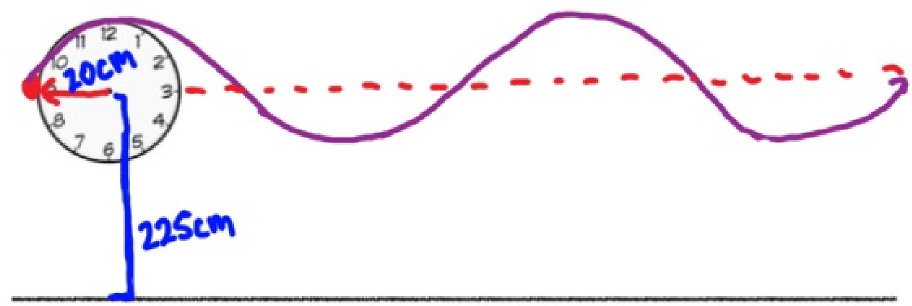
d. What is the magnitude of brightness after 2 weeks?

f(14) = 3.708 the average brightness after two weeks is 3.708



Trigonometric Graphing Applications

The height in cm of the tip of a second hand (the hand that keeps track of seconds) on a vertical clock face varies as a function of time in seconds. The second hand is 20 cm long, and the middle of the clock face is 225 cm above the ground.



a. Find a function to model the height of the second hand as a function of time assuming the hand is at the 9 o'clock position to start.

period = $\frac{2\pi}{B}$ period = 60

$\frac{2\pi}{B} = 60 \rightarrow B = \frac{\pi}{30}$

trig: sin

A = 20 B = $\pi/30$

C = none D = 225

Final Build: $\rightarrow h(t) = 20\sin\left(\frac{\pi}{30}t\right) + 225$

b. How far above the ground is the tip of the second hand after 15 seconds?

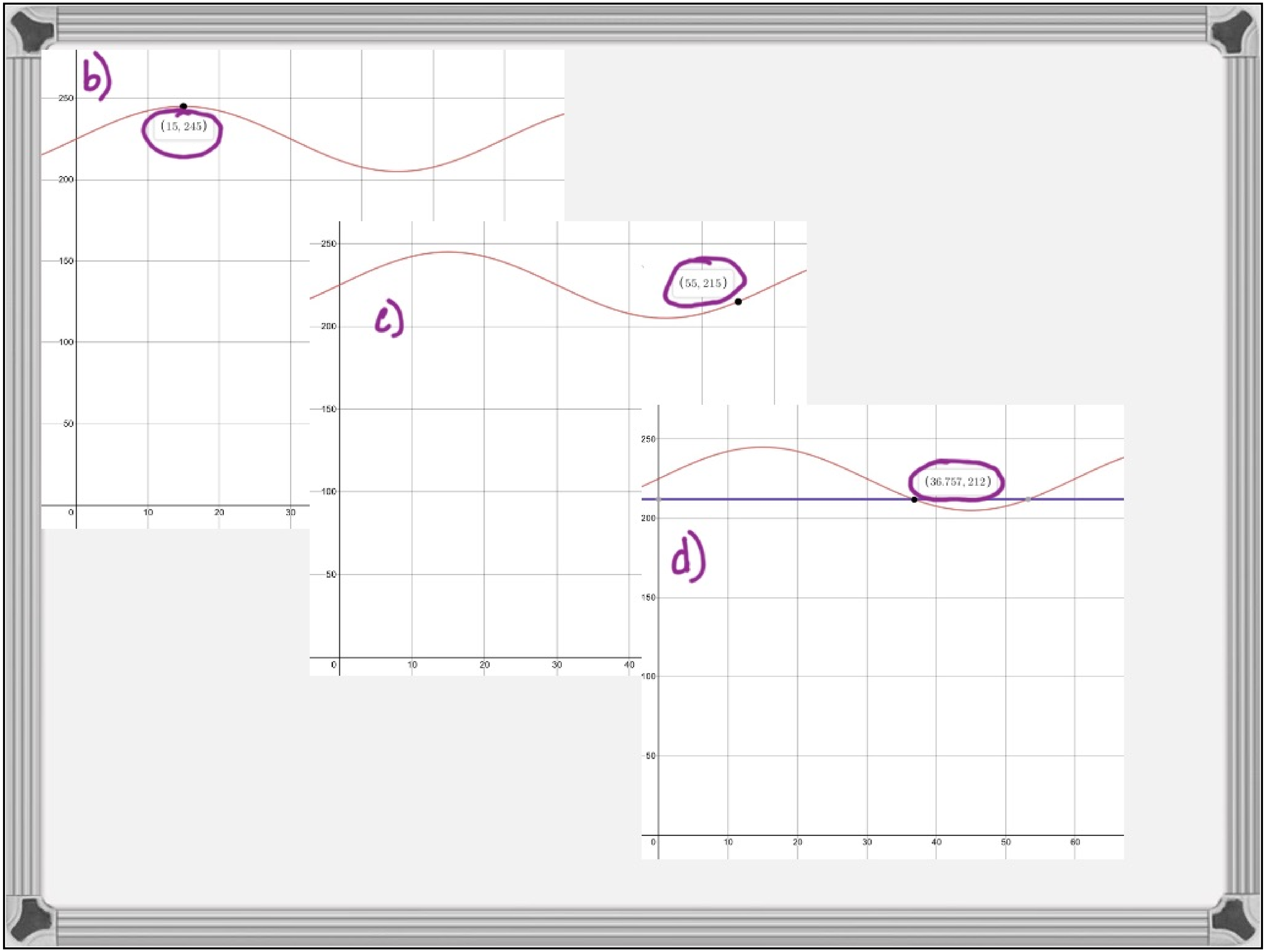
$h(15) = 245$ after 15 secs the tip of the second hand is 245 cm (graph next page)

c. How far above the ground is the second hand when it reaches the 8 o'clock mark?

$h(55) = 215$ at 8 o'clock the tip of the second hand is 215cm (graph next page)

d. Find the first time that the hand is 212 cm above the ground.

After 36.757 secs, the height of the hand in 212cm for the 1st time. (graph next page)


b)
(15, 245)
c)
(55, 215)
d)
(36.757, 212)
250
200
150
100
50
0
10
20
30
40
50
60