Periodicity (p.455–471)

1. $y = 2\sin 3t$

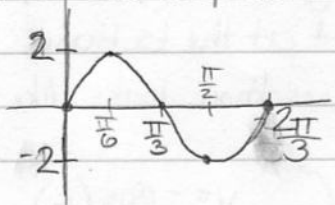
a) Find amplitude, period, and frequency

Amplitude: 2

Period: $\frac{2\pi}{3}$

Frequency: $\frac{3}{2\pi}$

b) Sketch a graph of the displacement over one period



7. $y = 900\cos 2t + 8000$

a) Max population is $900 \cdot 1 + 8000 = 8900$ predators

b) The length of time between periods of maximum population is the period, so $\frac{2\pi}{2} = \pi$, so every 3.141... years the population will be at its height.

8. $p(t) = 115 + 25\sin(160\pi t)$

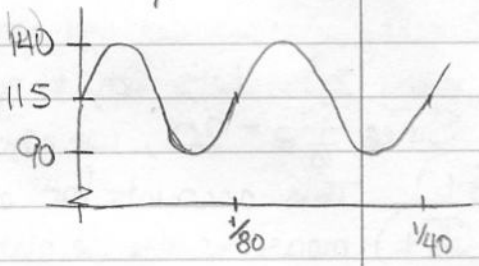
a) Find amplitude, period, and frequency

Amplitude: 25

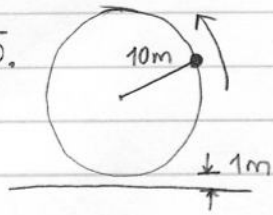
Period: $\frac{2\pi}{160\pi} = \frac{1}{80}$

Frenquency: $1/\frac{1}{80} = 80$

b)

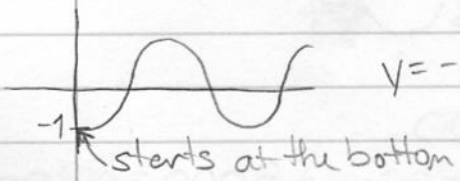


c) If a heart beats faster, the frequency increases and the period (the time between beats) decreases.

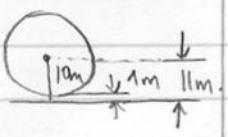
15. 

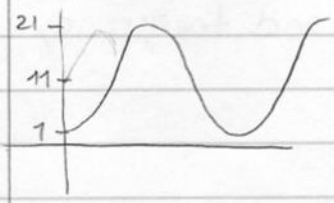
Find a function that describes the height above the ground of a person at time t as the wheel turns.

Think about how the graph should look like by thinking about riding a ferris wheel. You start at the bottom, then go up to the top then down again. Up, down, Up, down, ... Like a sine wave. Since we start at the bottom, we should use $-\cos(t)$ as our base since that looks like:



$y = -\cos(t)$ would be great if the wheel had radius 1 and had its center on the ground. But in this case it's not, so we need to make some adjustments. The wheel has radius 10m and is centered 11m above the ground so the function should be more like $y = 11 - 10\cos(t)$.





This is looking pretty good. One last concern is how fast the wheel turns. The problem says it makes one revolution every 20s. Let's say t counts seconds, so we want a period of 20. Since $\frac{2\pi}{\frac{1}{10}\pi} = 20$, we should use the function $y = 11 - 10\cos\left(\frac{\pi}{10}t\right)$. This accounts for everything.

FINAL ANSWER: $f(t) = 11 - 10\cos\left(\frac{\pi}{10}t\right)$ measures the height after t seconds