**Harmonic Analysis**

\*\*Decide if the graph is a ***sum*** or a ***product***

**Sum**—sinusoidal axis varies (but amplitude is constant/same height)

**Product**—amplitude varies (but sinusoidal axis is constant)

For SUM y = Large + Small

1. Draw **Larger** period sinusoid by drawing points of inflection and sketching curve (determine if it looks like cosine or sine)

Large

* Find Amplitude
* Find Period
* Write equation
1. For **Smaller** period equation: (determine the starting spot at x = 0 to decide if it is cosine or sine)

Small

* Find Amplitude
* Count # of small cycles within one of the larger cycles (Don’t forget to multiply that for your new equation)
* Write equation

For PRODUCT y = Large $∙$ Small

1. Draw **Larger** period sinusoid by sketching a curve touching all the maximum points and then the minimum points (forms an envelope curve) Determine the starting spot at x = 0 to decide if it is a cosine or sine.

Large

* Find Amplitude
* Find Period
* Write equation
1. For **Smaller** period equation:

Look at symmetry over y-axis.

 If **symmetrical**, then it is an **even** function and the functions will be the **same** $\cos(θ∙cosθ)$ or $\sin(θ∙sinθ)$

If there is **no symmetry**, then there will be **one of each** function in the product

$\cos(θ∙sinθ)$ or $\sin(θ∙cosθ)$

Small

* Remember Amplitude has already been found
* Count # of small cycles within one of the larger cycles (Don’t forget to multiply that for your new equation)

# cycles will be an **odd #** if the transition on the x-axis is the same throughout graph

# cycles will be an **even #** if the transition on x-axis is different

* Write equation