**Harmonic Form**





Where



 and 

⇒ , , 

**Harmonic Form Teaching Activity**

1. Draw . Make observations.
2. Experiment with other versions of  making further observations.
3. Realize that  can be written in the form and try to suggest reasons for these values (*R* ≈ 3.6, *α* ≈ 0.58).
4. Do the algebra. Equating both expressions and using double angle formulae:



$$3sinx+2cosx=Rsinxcosα+Rcosxsinα$$

Therefore:

$3sinx=Rsinxcosα $ ⇒ $3=Rcosα$ ⇒ $cosα=\frac{3}{R}$

$2cosx=Rcosxsinα $ ⇒ $2=Rsinα$ ⇒ $sinα=\frac{2}{R}$

 and 

1. Textbook or exam questions where students convert equations into harmonic form.
2. This question…

Rewrite $\sqrt{3}cosx-sinx$ in the form

1. $Rcos\left(x+α\right)$
2. $Rsin\left(x-α\right)$
3. Prove via graph transformations that your answers to part (a) and (b) are the same.