

**Examining graphs of  $y = a \sin x \pm b \cos x$** 

**Reference:** *Essential Advanced General Mathematics*  
Chapters 9,10: sections 9.12, 10.3.

**Mathematics required:**

*addition of ordinates; comparing tables of values; finding  $x$  and  $y$  intercepts of circular function graphs by algebraic methods; knowledge of the characteristics of circular function graphs.*

**Technology:**

*drawing graphs; adding graphs in **Y= screen**; determining appropriate window settings for graphs; writing  $a \sin x + b \cos x$  as  $r \sin(x + \beta)$  using **i. tCollect** **ii. sin regression SinReg**.*

1. **a.** On the TI-92, sketch the graphs of  $y_1 = \sqrt{3} \sin x$  and  $y_2 = \cos x$  for one period.
  - b. i.** Using  $y_3 = y_1(x) + y_2(x)$ , sketch the graph of  $y = \sqrt{3} \sin x + \cos x$ .
  - ii.** From this graph, use the calculator to find the amplitude, period and any other transformations so that  $y = \sqrt{3} \sin x + \cos x$  is an image of the basic ' $y = \sin x$ ' graph.
  - iii.** In the **Home screen**, use **F2, 9 tCollect**( $\sqrt{3} \sin x + \cos x$ ) to rewrite this function. Sketch this function in  $y_4 =$ .
  - v.** Compare the table of values for  $y_3$  and  $y_4$ .
  - vi.** Use an algebra method to find the  $x$  and  $y$  intercepts of the equation from  $y_4 =$ . Compare these with the graph drawn above.

2. Repeat the above activities for the following:

<b>i.</b> $y = \sin x + \sqrt{3} \cos x$	<b>ii.</b> $y = \sin x + \cos x$	<b>iii.</b> $y = \sin x - \cos x$	<b>iv.</b> $y = 2\sqrt{2} \sin x + \cos x$
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3. Read Chapter 10, Section 10.3, page244.
  - i.** Give an algebraic method for writing  $y = a \sin x + b \cos x$  in the form  $y = r \sin(x + \beta)$ .
  - ii.** Use this method to write the equations from question 2 in the form  $y = r \sin(x + \beta)$ . Check your results against the answers of part 2.
4. On the **Y= screen**, return to the graph  $y = \sqrt{3} \sin x + \cos x$ .
  - i.** Plot several representative points into **Plot1** for  $y = \sqrt{3} \sin x + \cos x$ .
  - ii.** Using a '**SinReg**' (sin regression), find the curve of best fit to this data. Compare this equation to 3**ii**.
  - iii.** Create two examples of your own and repeat steps 4 **i.** and **ii.**

Application Tasks

1. Text, Applications 10, page 248, question 1.
2. Text, Applications 10, page 248, question 2.