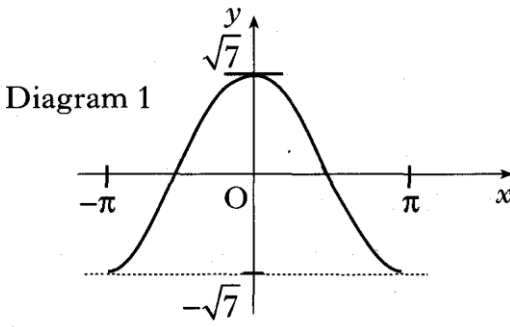
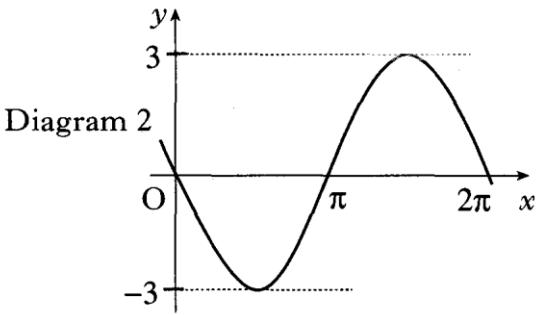
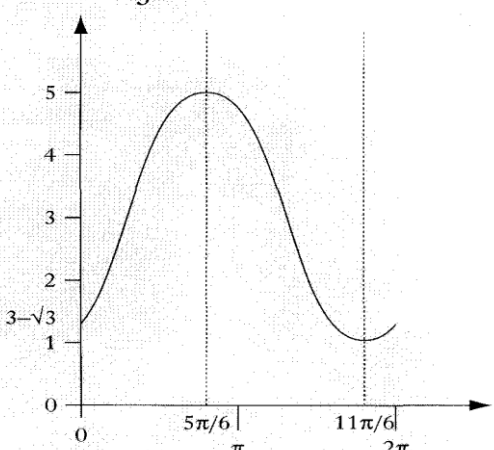
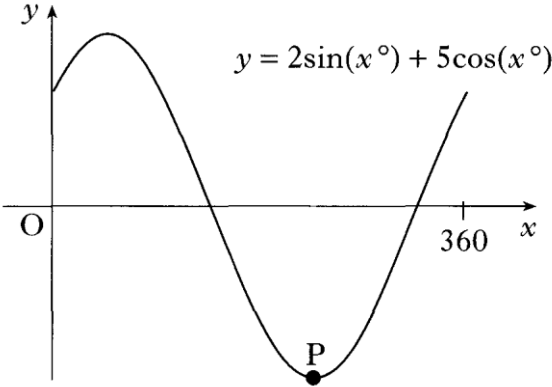
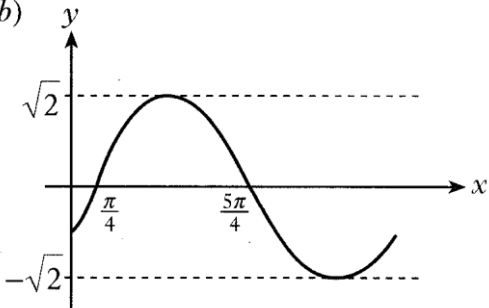


2010 P2	<p>2. (a) <math>12 \cos x^\circ - 5 \sin x^\circ</math> can be expressed in the form <math>k \cos(x + a)^\circ</math>, where <math>k &gt; 0</math> and <math>0 \leq a &lt; 360</math>.</p> <p>Calculate the values of <math>k</math> and <math>a</math>.</p> <p>(b) (i) Hence state the maximum and minimum values of <math>12 \cos x^\circ - 5 \sin x^\circ</math>.</p> <p>(ii) Determine the values of <math>x</math>, in the interval <math>0 \leq x &lt; 360</math>, at which these maximum and minimum values occur.</p>	4          3
Ans	<p>(a) <math>k=13, a = 22.6</math></p> <p>(b)</p> <ul style="list-style-type: none"> <li>•<sup>5</sup> 13, -13</li> <li>•<sup>6</sup> maximum at <math>337.4</math> and no others</li> <li>•<sup>7</sup> minimum at <math>157.4</math> and no others</li> </ul>	
2008 P2	<p>3. (a) (i) Diagram 1 shows part of the graph of <math>y = f(x)</math>, where <math>f(x) = p \cos x</math>.</p> <p>Write down the value of <math>p</math>.</p> <div style="text-align: center;">  <p>Diagram 1</p> </div> <p>(ii) Diagram 2 shows part of the graph of <math>y = g(x)</math>, where <math>g(x) = q \sin x</math>.</p> <p>Write down the value of <math>q</math>.</p> <div style="text-align: center;">  <p>Diagram 2</p> </div> <p>(b) Write <math>f(x) + g(x)</math> in the form <math>k \cos(x + a)</math> where <math>k &gt; 0</math> and <math>0 &lt; a &lt; \frac{\pi}{2}</math>.</p> <p>(c) Hence find <math>f'(x) + g'(x)</math> as a single trigonometric expression.</p>	2          4   2
Ans	<p>(a) <math>p = \sqrt{7}, q = -3</math>      (b) <math>4 \cos(x + 0.848)</math>      (c) <math>-4 \sin(x + 0.848)</math></p>	

2007 P2	<p>11. (a) Express <math>f(x) = \sqrt{3} \cos x + \sin x</math> in the form <math>k \cos(x - a)</math>, where <math>k &gt; 0</math> and <math>0 &lt; a &lt; \frac{\pi}{2}</math>.</p> <p>(b) Hence or otherwise sketch the graph of <math>y = f(x)</math> in the interval <math>0 \leq x \leq 2\pi</math>.</p>	4 4
Ans	<p>(a) <math>a = \frac{1}{2}</math>                      (c) <math>y = 3 \times 4^x</math>  <math>\log_{10} y = \log_{10} 3 + \log_{10}(4^x)</math>  <math>= \log_{10} 3 + x \log_{10}(4)</math></p> <p>(b) <math>b = \frac{3}{2}</math>                      So gradient of line = <math>\log_{10}(4)</math></p>	
2006 P2	<p>10. A curve has equation <math>y = 7 \sin x - 24 \cos x</math>.</p> <p>(a) Express <math>7 \sin x - 24 \cos x</math> in the form <math>k \sin(x - a)</math> where <math>k &gt; 0</math> and <math>0 \leq a \leq \frac{\pi}{2}</math>.</p> <p>(b) Hence find, in the interval <math>0 \leq x \leq \pi</math>, the <math>x</math>-coordinate of the point on the curve where the gradient is 1.</p>	4 3
Ans	<p>(a) <math>k = 25</math>  <math>a = 1.29</math></p> <p>(b) <math>x = 2.82</math></p>	
2005 P1	<p>10. (a) Express <math>\sin x - \sqrt{3} \cos x</math> in the form <math>k \sin(x - a)</math> where <math>k &gt; 0</math> and <math>0 \leq a \leq 2\pi</math>.</p> <p>(b) Hence, or otherwise, sketch the curve with equation <math>y = 3 + \sin x - \sqrt{3} \cos x</math> in the interval <math>0 \leq x \leq 2\pi</math>.</p>	4 5
Ans	<p>(a) <math>2 \sin(x - \frac{\pi}{3})</math></p> <p>(b)</p> 	
2004 P2	<p>6. (a) Express <math>3 \cos(x^\circ) + 5 \sin(x^\circ)</math> in the form <math>k \cos(x^\circ - a^\circ)</math> where <math>k &gt; 0</math> and <math>0 \leq a \leq 90</math>.</p> <p>(b) Hence solve the equation <math>3 \cos(x^\circ) + 5 \sin(x^\circ) = 4</math> for <math>0 \leq x \leq 90</math>.</p>	4 3
Ans	<p>(a) <math>\sqrt{34} \cos(x - 59)^\circ</math></p> <p>(b) <math>x = 12.3</math></p>	

2003 P2	<p>7. Part of the graph of <math>y = 2\sin(x^\circ) + 5\cos(x^\circ)</math> is shown in the diagram.</p> <p>(a) Express <math>y = 2\sin(x^\circ) + 5\cos(x^\circ)</math> in the form <math>k\sin(x^\circ + a^\circ)</math> where <math>k &gt; 0</math> and <math>0 \leq a &lt; 360</math>.</p> <p>(b) Find the coordinates of the minimum turning point P.</p>		4 3
Ans	<p>(a) <math>\sqrt{29}\sin(x + 68.2)^\circ</math></p> <p>(b) <math>(201.8^\circ, -\sqrt{29})</math></p>		
2002W P2	<p>4. (a) Write <math>\sqrt{3}\sin x^\circ + \cos x^\circ</math> in the form <math>k\sin(x + a)^\circ</math> where <math>k &gt; 0</math> and <math>0 \leq a &lt; 360</math>.</p> <p>(b) Hence find the maximum value of <math>5 + \sqrt{3}\sin x^\circ + \cos x^\circ</math> and determine the corresponding value of <math>x</math> in the interval <math>0 \leq x \leq 360</math>.</p>	4 2	
Ans	<p>(a) <math>2\sin(x+30)^\circ</math></p> <p>(b) <math>\max = 7</math> when <math>x = 60</math></p>		
2002 P1	<p>9. (a) Write <math>\sin(x) - \cos(x)</math> in the form <math>k\sin(x - a)</math> stating the values of <math>k</math> and <math>a</math> where <math>k &gt; 0</math> and <math>0 \leq a \leq 2\pi</math>.</p> <p>(b) Sketch the graph of <math>y = \sin(x) - \cos(x)</math> for <math>0 \leq x \leq 2\pi</math>, showing clearly the graph's maximum and minimum values and where it cuts the <math>x</math>-axis and the <math>y</math>-axis.</p>	4 3	
Ans	<p>(a) <math>\sqrt{2}\sin(x - \frac{\pi}{4})</math></p> <p>(b) </p>		
2001 P2	<p>5. Express <math>8\cos x^\circ - 6\sin x^\circ</math> in the form <math>k\cos(x + a)^\circ</math> where <math>k &gt; 0</math> and <math>0 &lt; a &lt; 360</math>.</p>	4	
Ans	<p><math>10\cos(x + 36.9)^\circ</math></p>		
2000 P1	<p>10. Find the maximum value of <math>\cos x - \sin x</math> and the value of <math>x</math> for which it occurs in the interval <math>0 \leq x \leq 2\pi</math>.</p>	6	

<i>Ans</i>	max value = $\sqrt{2}$ when $x = \frac{7\pi}{4}$	
<i>Specimen 2 P1</i>	<p>6. <math>f(x) = \sqrt{3}\sin x^\circ - \cos x^\circ</math></p> <p>(a) Express <math>f(x)</math> in the form <math>k\sin(x - a)^\circ</math> where <math>k &gt; 0</math> and <math>0 \leq a &lt; 360</math>.</p> <p>(b) Hence solve the equation <math>f(x) = \sqrt{2}</math> in the interval <math>0 \leq a &lt; 360</math>.</p>	4 3
<i>Ans</i>	<p>(a) compare <math>\sqrt{3}\sin x^\circ - \cos x^\circ</math> with <math>k\sin x^\circ \cos a^\circ - k\cos x^\circ \sin a^\circ</math></p> <p><math>k\cos a^\circ = \sqrt{3}, k\sin a^\circ = 1</math></p> <p><math>k = 2, \tan a^\circ = \frac{1}{\sqrt{3}} \Rightarrow a = 30</math></p> <p>(b) <math>2\sin(x - 30)^\circ = \sqrt{2}</math></p> <p><math>x - 30 = 45, 135</math></p> <p><math>x = 75, 165</math></p>	
<i>Specimen 1 P2</i>	<p>6. <math>f(x) = 2\cos x^\circ + 3\sin x^\circ</math>.</p> <p>(a) Express <math>f(x)</math> in the form <math>k\cos(x - \alpha)^\circ</math> where <math>k &gt; 0</math> and <math>0 \leq \alpha &lt; 360</math>.</p> <p>(b) Hence solve <math>f(x) = 0.5</math> for <math>0 \leq x &lt; 360</math>.</p> <p>(c) Find the <math>x</math>-coordinate of the point nearest to the origin where the graph of <math>f(x) = 2\cos x^\circ + 3\sin x^\circ</math> cuts the <math>x</math>-axis for <math>0 \leq x &lt; 360</math>.</p>	4 3  2
<i>Ans</i>	<p>(a) <math>\sqrt{13}\cos(x - 56.3)^\circ</math></p> <p>(b) 138.8, 334.3</p> <p>(c) 146.3°</p>	