

Extension 1 Miscellaneous Worksheet



- Express $3 \sin x + 4 \cos x$ in the form $A \sin(x + \alpha)$ where $0 \leq \alpha \leq \pi/2$
Hence, or otherwise, solve $3 \sin x + 4 \cos x = 5$ for $0 \leq x \leq 2\pi$. Give your answer, or answers, correct to two decimal places.
- Prove that $\tan^2 \theta = (1 - \cos 2\theta) / (1 + \cos 2\theta)$, provided that $\cos 2\theta \neq -1$.
 - Hence find the exact value of $\tan \pi/8$
- Let two points $P(2t, t^2)$ and $Q(4t, 4t^2)$ move along the parabola $x^2 = 4y$ and the tangents to the parabola at P and Q meet at R .
 - Show that the equation of the tangent at P is $y = tx - t^2$.
 - Write down the equation of the tangent at Q , and find the coordinates of the point R in terms of t .
 - Find the Cartesian equation of the locus of R .
- Given that $\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta$ for all values of θ . Use this result to solve $\sin 3\theta + \sin 2\theta = \sin \theta$ for $0 \leq \theta \leq 2\pi$.
- if $x/a \cos A + y/b \sin A = 1$ and $x/a \sin A - y/b \cos A = 1$ then prove that $x^2/a^2 + y^2/b^2 = 2$
- If $x \cos \alpha - y \sin \alpha = a$ and $x \sin \alpha + y \cos \alpha = b$, prove that $x^2 + y^2 = a^2 + b^2$.
- Find the length of b in a right triangle when $a = 40$, c (the hypotenuse) $= 40\sqrt{3}$, and $\angle B = 30^\circ$.
- In what ratio is the line segment joining the points $(-3, -2)$ and $(6, 1)$ divided by the y -axis?
- The interval AB , where A is $(4, 5)$ and B is $(19, -5)$, is divided internally in the ratio $2 : 3$ by the point $P(x, y)$. Find the values of x and y
- For what values of b is the line $y = 12x + b$ tangent to $y = x^3$?