
Mercury

Question - Indices and simplification

Simplify

$$\frac{\sqrt{x} (yz)^2}{x^3 y^{-3/2}}$$

into the form $x^a y^b z^c$ for numbers a , b and c .

Question - Algebra simplification and factorization

Simplify this expression and then take out a common factor to factorize:

$$3x^2 + 4xy - x^2 - 6xy$$

Question - Trigonometry

If a right-angled triangle's two shortest sides are 5 and 12, work out how long the longest side is, and give a formula for the smallest of the three angles inside the triangle using an inverse trigonometric function.

Good link - Reciprocal trigonometric functions

Give definitions of the functions sec, cot and cosec.

Then for practice of sec, cot and cosec use the Khan Academy link on the Syllabus page

Question - See HELM notes on Trigonometric identities (Exercise 2)

Show that

$$(1 + \sin(t))(1 + \sin(-t)) \equiv \cos^2(t)$$

Hint: Begin with just the left-hand side. Expand it out, try and simplify where you can aiming to reach a trigonometric identity for $\cos^2(t)$ which mentions only $\sin(t)$. Along the way you'll have to think about what $\sin(t)$ equals compared to $\sin(-t)$.

Question - Hyperbolic functions

Calculate $2 \sinh(x) \cosh(x)$, what function is it equal to?

Method: Substitute with the $(e^x \pm e^{-x})/2$ formulae for $\sinh(x)$ and $\cosh(x)$ etc. and then try and simplify the algebra.