Chapter 6 - Trigonometric Functions

Personal notes:

6.1 - Secant, cosecant and cotangent

Notes

The following functions are known as _____trigonometric functions:

Example

Work out the values of

a) $\sec 280^o$
b) $\cot 115^o$
c) $cosec\frac{\pi}{4}$
d) $\sec\frac{5\pi}{3}$

I know the difference

Original	$\sin x$	$\cos x$	$\tan x$
Squared			
Reciprocal			
Inverse			

6.2 - Graphs of $cosec\ x$, $\sec x$ and $\cot x$

Sketching graphs of $cosec\ x$, $\sec x$, $\cot x$

Example

a) Sketch the graph of $y = 4cosec\ x, \ -\pi \leq x \leq \pi$.
b) On the same axes, sketch the line $y = x$.
c) State the number of solutions to the equation $4cosec\ x - x = 0, \ -\pi \leq x \leq \pi$

6.2 - Graphs of $cosec\ x$, $\sec x$ and $\cot x$

Practice

Sketch $y = \sec 2x - 1$ in the interval $0 \leq x < 2\pi$.

6.3 - Using $cosec\ x$, $\sec x$ and $\cot x$

Notes

- Exam questions usually come in two types:
  - Prove / Show (Start from either the LHS/RHS and prove your way to the other side)
  - Solve

Example

a) Simplify $\sin\theta \cot\theta \sec\theta$

b) Simplify $\sin\theta \cos\theta$

c) Prove that $\frac{\cot\theta\ cosec\ \theta}{\sec^2\theta + cosec^2\theta} \equiv \cos^3\theta$

6.3 - Using $cosec\ x$, $\sec x$ and $\cot x$

Practice

Prove that $\sec x - \cos x \equiv \sin x \tan x$

Practice

Prove that $(1 + \cos x)(cosec\ x - \cot x) \equiv \sin x$

Example

Solve the following equations in the interval $0 \leq \theta \leq 360°$:

a) $\sec \theta = -2.5$

b) $\cot 2\theta = 0.6$

6.3 - Using $cosec\ x$, $\sec x$ and $\cot x$

Example (Special)

Solve $\cot\theta = 0$ in the interval $0 \leq \theta \leq 2\pi$

Practice

Solve in the interval $0 \leq \theta < 360°$:

$cosec\ 3\theta = 2$

6.4 - Trigonometric identities

Recall
How many trigonometric identities could you remember?

Notes (New trig identities)

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-

Example
Prove that $cosec^4\,\theta - \cot^4\,\theta = \frac{1+\cos^2\,\theta}{1-\cos^2\,x}$

Practice
Prove that $\sec^2\,\theta - \cos^2\,\theta = \sin^2\,\theta\left(1 + \sec^2\,\theta\right)$

6.4 - Trigonometric identities

Example

Solve the equation $4\,cosec^2\theta - 9 = \cot\theta$ in the interval $0 \leq \theta \leq 360°$

Exam Practice

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6. (ii) Solve, for $0 \leq \theta < 2\pi$, the equation

$$3\sec^2\theta + 3\sec\theta = 2\tan^2\theta$$

You must show all your working. Give your answers in terms of π.

(6)

6.5 - Inverse trigonometric identities

Recall

There are two types of mapping function (Yr 2 Chp 2.2)

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Only one of the above two has an inverse function:
-> Why?

Inverse Trig functions and graphs

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-
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6.5 - Inverse trigonometric identities

Example

Work out, in radians, the values of:

a) $\arcsin\left(-\frac{\sqrt{2}}{2}\right)$

b) $\arccos(-1)$

c) $\arctan\left(\sqrt{3}\right)$

Example (Ex. 6E Q6)

E/P **6** Given that x satisfies $\arcsin x = k$, where $0 < k < \frac{\pi}{2}$,

a state the range of possible values of x **(1 mark)**

b express, in terms of x,

i $\cos k$ **ii** $\tan k$ **(4 marks)**

Given, instead, that $-\frac{\pi}{2} < k < 0$,

c how, if at all, are your answers to part **b** affected? **(2 marks)**

Exam Practice

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8. (ii) Given that

$$y = \arccos x, \quad -1 \leq x \leq 1 \quad \text{and} \quad 0 \leq y \leq \pi,$$

(*a*) express $\arcsin x$ in terms of y.

(2)

(*b*) Hence evaluate $\arccos x + \arcsin x$. Give your answer in terms of π.

(1)