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GLASGOW CALEDONIAN UNIVERSITY

ENGINEERING MATHS II - TOPIC SUMMARY

Revision topic: Simplification and Factorisation

Objectives:

◇ Get a deeper appreciation of what simplified and factorised expressions look like

◇ Appreciate that simplifying is about trying (some things can't be simplified any more but you may not know until you try)

Key points:

Factorisation is an example of a simplification technique. The idea is always to write complicated expressions is a 'nice' way which make understanding and calculation more easy.

Sometimes simplification might involve removing brackets and cancelling terms, while sometimes it might involve inserting brackets. Through practice you will learn which is useful in each problem.

For example, $(x+3)(x-3)+9$ can be simplified to x^2 by multiplying out the brackets. While $x^3 + 3x^2 + 3x + 1$ can be simplified to $(x+1)^3$. Notice that in both these cases the simplified version is easier to use for calculating the expression's value.

The purpose of factorising a quadratic equation is that after its been factorised it's easy to spot the solutions! For example, if you want to solve $x^2 + 5x + 6 = 0$ then if you factorise and get

$$(x+2)(x+3) = 0$$

Then you can use the key fact that 'if two brackets multiplied together equals zero' then at least one of the brackets must equal zero. In this example we deduce that $x = -2$ (first bracket zero) or $x = -3$ (second bracket zero).

Useful Fact: Simplification is an art not a science! Experts often don't know when they start simplifying if an expression is going to get messier or nicer. They are just good at giving up and trying something else when it doesn't work.

> **Main advice**: Practice, practice, practice! Learn what works and what doesn't.

Recommended links:

Highly recommended: HELM notes (on simplification and factorisation)

Other links: Khan Academy factorisation link (3-part lesson on factorisation), Khan Academy quadratic factoring link