The Big 50 Revision Guidelines for C3

If you can understand all of these you'll do very well…

1. Know how to recognise linear algebraic factors, especially within "The difference of two squares", in order to cancel algbraic fractions

2. Know that any two algebraic fractions (rational expressions) can be added or subtracted by finding and using a common denominator

3. Know how to divide one polynomial expression by another using long division or by inspection, giving the original in the form Quotient x Divisor + Remainder

4. Understand and use the Factor Theorem to help check for common factors

5. Understand and use the Remainder Theorem to assist with algebraic division

6. Know the difference between a function and a mapping, and be able to illustrate each one graphically using mapping diagrams and (x,y) graphs

7. Know the definition of a function as a one-to-one or many-to-one mapping, and the associated definitions of Domain and Range

8. Understand and use the correct notation for Integers and Real Numbers when describing domains and ranges

9. Understand and use the concepts and notation for composite and inverse functions

10. Understand and use the Modulus function, especially in the context of graph sketching and transformations

11. Know how to sketch a graph which has been transformed by a horizontal or vertical translation, or by a 'stretch' vertically or horizontally, or by the introduction of a Modulus

12. Know the definitions of arcsin, arccos and arctan in relation to the three basic trigonometrical functions, and the graphs, domains and ranges of all these functions

13. Know the definitions of secant, cosecant and cotangent in relation to the three basic trigonometrical functions, and the graphs, domains and ranges of all these functions

14. Understand radian measure as an alternative to degree measure, and be able to switch between the two systems

15. Know the exact values of $\sin\theta$, $\cos\theta$ and $\tan\theta$ (where defined) for values of θ in the set $\theta = \{0^\circ, 30^\circ, 45^\circ, 60^\circ, 90^\circ, 180^\circ, 270^\circ, 360^\circ\}$ and their radian equivalents.

16. Know how to use the unit circle and Pythagoras' Theorem to deduce the relationship between $\sin\theta$ and $\cos\theta$, and to deduce the equivalent relationships involving $\sec\theta$, $\operatorname{cosec}\theta$, $\tan\theta$ and $\cot\theta$

17. Understand and use the Addition (Compound Angle) formulae for $\sin(A \pm B)$, $\cos(A \pm B)$ and $\tan(A \pm B)$ to deduce the Double Angle Formulae

18. Understand and use the Addition formulae for $\sin(A \pm B)$, $\cos(A \pm B)$ and $\tan(A \pm B)$ and other basic trigonometric identities to prove new identities

19. Understand and use the Addition formulae for $\sin(A \pm B)$, $\cos(A \pm B)$ and $\tan(A \pm B)$ to write expressions of the form $a\cos\theta + b\sin\theta$ in the equivalent form $R\sin(\theta \pm \alpha)$ or $R\cos(\theta \pm \alpha)$, where R and θ are constants to be determined through the solution of an appropriate pair of simultaneous equations

20. Know how to derive the Trigonometric Factor Formulae from the Trigonometric Addition Formulae

21. Know how to use the Factor Formulae to write a sum or difference using $\sin\theta$ OR $\cos\theta$ to a product using $\sin\theta$ AND $\cos\theta$

22. Know how to use the standard trigonometric identities to find exact values of trigonometric expressions without a calculator

23. Know how to use the Four Quadrant Diagram ("ASTC") to find all solutions to a given trigonometrical equation, given the basic solution and the desired interval for θ

24. Know how to write the general solution to a trigonometrical equation from the basic solution by appropriate use of $\pm 180n°$ or $\pm 360n°$ or similar

25. Know how to solve equations of the form $a\cos\theta + b\sin\theta = c$ by writing the left hand side in the form $R\sin(\theta \pm \alpha)$ or $R\cos(\theta \pm \alpha)$

26. Understand and sketch the graph of $y = e^x$ and related graphs such as $y = e^{ax+b} + c$

27. Understand and use exponential models to describe real-life situations such as populations and investment growth

28. Know experimentally (using graph plotting software for example) that there is a number *a* between 2 and 3 such that the graph of $y = a^x$ coincides exactly with the graph of its gradient function, and that the exact value of *a* is *e*.

29. Understand and sketch the graph of the natural logarithm function $y = \ln x$ and elementary transformations of this graph

30. Know that not only is $\ln x$ the inverse function of e^x, but that it is also the integral of the previously unintegrable function $\frac{1}{x}$.

31. Know how to manipulate expressions involving e^x and $\ln x$ by recourse to the definitions and properties of these functions (such as $\ln 1 = 0$ and $e^{\ln x} = \ln(e^x) = x$) and the standard procedures for manipulating indices and logs

32. Know how to solve equations of the form $e^{ax+b} = p$ and $\ln(ax+b) = q$, and to give the answer in exact form if required

33. Know how to differentiate the functions e^x and $\ln x$, both individually and as part of a more complicated function

34. Know how to differentiate the functions $\sin x$, $\cos x$ and $\tan x$, both individually and as part of a more complicated function

35. Know how to differentiate the functions $\sec x$, $\operatorname{cosec} x$ and $\cot x$, both individually and as part of a more complicated function

36. Know when and how to use the Chain Rule in differentiation, and to have an appreciation of the proof of this rule

37. Know when and how to use the Product Rule in differentiation, and to have an appreciation of the proof of this rule

38. Know when and how to use the Quotient Rule in differentiation, and to have an appreciation of the proof of this rule

39. Know how to use a combination of two or more of the Differentiation Rules when differentiating functions generated from the standard forms using product, quotient and composition

40. Understand and use $\frac{dx}{dy} = \frac{1}{\frac{dy}{dx}}$, especially when differentiating $x = f(y)$

41. Understand the distinction between the exact (analytical) solution of an equation and the numerical solution of an equation to any desired accuracy

42. Know what is meant by the Roots of a function $f(x)$ and the link with the Solutions of the equation $f(x) = 0$

43. Understand how by considering changes in the sign of $f(x)$ within an interval [*a*, *b*] on which $f(x)$ is continuous, one can locate one or more roots of $f(x)$

44. Understand how by considering changes in the sign of $f(x)$ within an interval [*a*, *b*] on which $f(x)$ is continuous, one can demonstrate that a given root has the desired degree of accuracy

45. Understand what is meant by a Recurrence Relation $x_{n+1} = f(x_n)$

46. Know how to use a given recurrence relation to create an iterative process for the numerical solution to the associated equation, to the desired degree of accuracy, or else to demonstrate that the iterative process does not converge

47. Know how to use the [Ans] facility on a scientific calculator to program a given iterative process efficiently for rapid convergence

48. Understand and use correctly the full range of symbols and notation expected at this level

49. Understand what is meant by, and strive to produce, 'elegant' and direct solutions

50. Know which formulae and results have to be memorised and which are provided in the formula book – if in doubt, learn them all as this will improve your speed and reliability dramatically