

EDExcel ANALYTICAL METHODS FOR ENGINEERS H1

UNIT 2 - NQF LEVEL 4

OUTCOME 3 - CALCULUS

TUTORIAL 2 – MAXIMA AND MINIMA

The calculus: the concept of the limit and continuity; definition of the derivative; derivatives of standard functions; notion of the derivative and rates of change; differentiation of functions using the product, quotient and function of a function rules; integral calculus as the calculation of area and the inverse of differentiation; the indefinite integral and the constant of integration; standard integrals and the application of algebraic and trigonometric functions for their solution; the definite integral and area under curves

Further differentiation: second order and higher derivatives; logarithmic differentiation; differentiation of inverse trigonometric functions; differential coefficients of inverse hyperbolic functions

Further integration: integration by parts; integration by substitution; integration using partial fractions

Applications of the calculus: eg maxima and minima; points of inflexion; rates of change of temperature; distance and time; electrical capacitance; rms values; electrical circuit analysis; ac theory; electromagnetic fields; velocity and acceleration problems; complex stress and strain; engineering structures; simple harmonic motion; centroids; volumes of solids of revolution; second moments of area; moments of inertia; rules of Pappus; radius of gyration; thermodynamic work and heat energy

Engineering problems: eg stress and strain; torsion; motion; dynamic systems; oscillating systems; force systems; heat energy and thermodynamic systems; fluid flow; ac theory; electrical signals; information systems; transmission systems; electrical machines; electronics

This tutorial devoted to maxima and minima should be studied if you have not covered this work previously.

You should judge your progress by completing the self assessment exercises.

On completion of this tutorial you should be able to do the following.

- Define a maximum and minimum point of a function.
- Define a turning point.
- Define a point of inflection.
- Use differential calculus to determine these points.
- Use differential calculus to determine if a point is a maximum or minimum.
- Solve practical problems by applying the theory.

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