Curve analysis and optimisation

Learn and practise | Free preview

A sample from this topic. The complete topic collection contains three different resources and worked solutions.

Read the worked example, then show each step in the practice questions. Show the mathematical steps. A calculator, graphing tool or CAS may be used to check results where useful.

What you will practise

• Graph analysis, stationary points and optimisation

Useful starting skills: Mathematical Methods Units 1–2 functions, algebra, probability and introductory calculus.

Find stationary points by solving $f'=0$, then analyse sign changes or curvature. A point of inflection requires a change in concavity; $f''=0$ alone is not sufficient.

For maximum or minimum on a closed interval, compare all relevant stationary values and endpoint values. Build constraints and units into the model before optimising.

Worked example

Find global extrema of $f(x)=x^2-4x+1$ on $[0, 5]$.

Stationary $x=2$; compare $f(0)=1$, $f(2)=-3$, $f(5)=6$.

Answer: Minimum -3 at $x=2$; maximum 6 at $x=5$.

Try it yourself

Name: _____ Date: _____

1. Find stationary points of x^3-3 x^2.

2. Find inflection point of x^3-3 x^2.

Answers and explanations

Check the method as well as the final answer. An alternative correct method is also valid.

1. (0, 0) maximum; (2, -4) minimum.

$f'=3\,x(x-2)$ has signs+, -, +.

2. (1, -2).

$f''=6\,x-6$ changes sign at 1.

Curriculum reference: Mathematical Methods Units 3–4 — Graph analysis, stationary points and optimisation

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