

Pre-STEP School online lecture series: Lecture 2– Question 1

1 Let $f(x) = x^m(x-1)^n$, where m and n are both integers greater than 1. Show that the curve $y = f(x)$ has a stationary point with $0 < x < 1$. By considering $f''(x)$, show that this stationary point is a maximum if n is even and a minimum if n is odd.

Sketch the graphs of $f(x)$ in the four cases that arise according to the values of m and n .

[2002 M1 no 2]

Please provide answers to the following discussion questions. Don't include full calculations in your responses, just explore the question and try to anticipate routes through it.

1. What is a sensible way to get a feel for the curves that you are asked to look at in this question?
2. Clearly things depend on whether m, n are odd/even. How might you get a feel for this before you begin the question?
3. Without actually doing any differentiation describe what you expect the expression for $f(x)$ to look like and how you expect to solve $f(x) = 0$.
4. How about the expression for $f'(x)$?

Submit your answers by e-mail to
stepeasterschool@maths.org by Friday 9th
March 2012 with the subject line: Lecture 2
Question 1

Selected responses will be referred to in
Lecture 2.