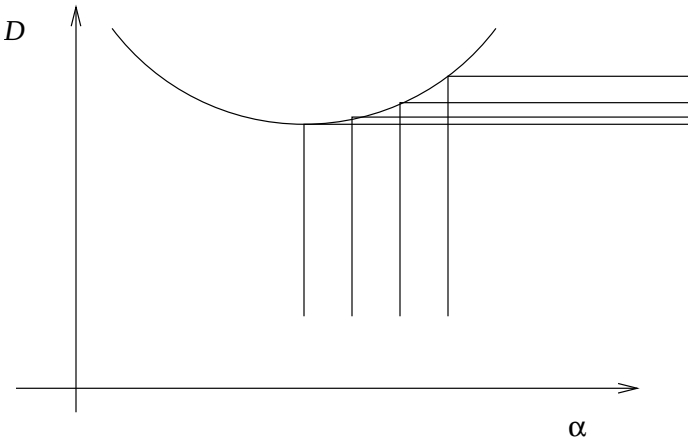
Worksheet 5. Rainbows. MA113:005-008
Calculus I Fall 2005

1. This assignment will be from the fifth edition of Stewart, page 232. Carry out parts 1 to 3 of the project "The calculus of rainbows". In part 1, you do not need to show that the critical number is a minimum. As I try to explain below, any critical number should lead to a concentration of light.

2. (1 point extra credit) The sky below a rainbow is often either brighter or darker than the sky above the rainbow. Is it brighter or darker? According to Stewart (and I checked this), the critical number you found in part 1) is in fact a minimum. Use that the critical number is a minimum to help explain why it is brighter or darker below the rainbow.

We have used critical numbers to help us find local extreme values for a function. This project shows another reason why the critical numbers of a function are important. The critical numbers give points where the function is essentially constant (another name for a point where the derivative is zero is stationary point). When we see a rainbow in the sky, the rainbow is formed by light rays being concentrated near a critical point of the function $D(\alpha)$ discussed in this project. The drawing below helps to show why a rainbow corresponds to a critical number of $D(\alpha)$. The graph shows that near a critical number of D, equally spaced values of α, lead to values of D which are concentrated near the value of D at the critical point.



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