

Before teaching calculus

by Sidney Schuman

As a teacher of calculus to sixth-form students, I was aware of how the word calculus caused fear among many of them. The emphasis on 'rate-of-change' tended to alienate them, as it was unlike anything they had previously come across. Learning about calculus was always going to be a problem for these students. This problem can be avoided if calculus is introduced not in terms of gradient but in terms of area. We learn about area soon after we learn about number. Our understanding of area is continually reinforced by our experience so that the concept becomes successfully internalised. Compared with this, students may have only a shaky idea of gradient - they 'know' about it but it's not seen as part of their lives.

While the differential calculus is concerned with variation of gradient, the integral calculus relates to the everyday matter of quantity. This suggests that the integral power rule would be a better starting point than the differential power rule. All that is needed is a suitable method of obtaining the integral power rule independently. By suitable I mean a method that is comparable to the numerical method commonly used to establish the differential power rule. Such a method does exist and I suggest that it helps to make the student less anxious about their subsequent calculus studies. Both calculus power rules are obtained independently of each other, without any reference to the concept of the limit, infinitesimals or measurement of gradient.

In Power Maths the integral power rule is obtained with Figure 1, the differential power rule with Figure 2.

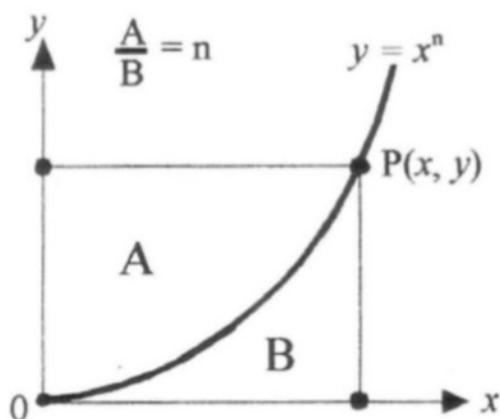


Figure 1

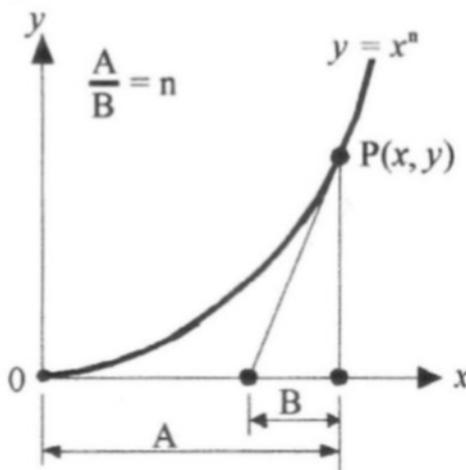


Figure 2

The advantage of using such a pre-calculus taster is that students gain confidence in the provenance and use of the two power rules, enabling them to more easily to later accept the underlying theory. Or put in another way, with the area foundation we can help them build their calculus power rule walls and put the calculus theory roof on later.

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