In this video, I will discuss how I have developed component one of the application task. So the requirement of an application task is a mathematical investigation based on the context involving content from two or more areas of study.

So I thought, "Perhaps I could write questions that are a selection of content from the functions and graphs and calculus." Keep in mind a task for school assessed coursework will not cover all the content from the area of study or topic, or all of the key knowledge and skills for an outcome. In other words, less is more. Before I go any further I thought it would be beneficial to revisit the SAC report and the VCE specialist SAC PowerPoint, which are available from the VCE study page for specialist maths.

Here is an extract from the PowerPoint. For the application task suitable constants parameters, variables, functions, and relations, and operations for a topic of interest, situation, or context should be used and related to questions investigated. A task should not be too directive or mirror an extended set up examination style questions. Multiple choice items are not suitable for either an application task or a modelling or problem-solving task, and are not to be used. So keep all of that in mind.

I thought, "Well, where do I start?" I came up with a function, x times e to the x. Then I use Desmos to sketch this graph, its derivative and its anti-derivative. I've then tested this function further by changing it to x square, e to the x and x cube e to the x. And I thought, "Well, we go for x, e to power 2x, x, e to power 3x, et cetera." Then I thought, "Well, there's a lot of potential here for students to explore a function of the form x to the n e, kx." However, I thought, "Well, let's start off with one specific case where n equals one and k equals to one."

So you can see the slide there, my first question was, consider this special case where n equal one and k equal one. And I asked students to graph the function and an anti-derivative function as well. Then I'll move on to part b, asking students to show how the graph of the derivative function can be obtained from the graph of the function and how the graph of an anti-derivative function can be obtained from the graph of the function?

And then part c, asking students explain how differentiating the function relates to finding an anti-derivative of a function? Well, this one here is the integration by recognition that I put it in.

Moving on to part d, this question is designed to give students an opportunity to choose their own values, to explore the function, in depth, which in turn can be considered to be the inclusion of an open ended questions. This question will enable students to demonstrate different levels of achievement. So you can see in this one here, students have to now decide to choose different values of n and k. Play with the function, and could come up with graphs, differentiate, find an anti-derivative, graphing it.

And then into part e, of course, after they have played with the functions they then discuss the role of n and k in terms of finding an anti-derivative function.

Now let's move on to something else here. Oh well, it's really, depending on your students cohort. You can scaffold the question in component one to ensure that students have an entry point. You don't want to receive a SAC with any blank pages. You can start off with the n equal one and k equal one. And in part one ask students to get to the graph of y equals f, showing all key features, such as axis of intercept, asymptotes, stationary points, points of inflection, and symmetry identified.

Part two, you can then ask students to show that the derivative of f equals to e to the x times x plus one. which is the part one that I'll show on the screen on the PowerPoint here.

The next part is using the result from the previous part, show that an anti-derivative of f is e to the x times x minus one. And of course this is the integration by recognition. And then get them to find the area bounded by the graph of f. The x-axis, the lines x equals zero, and x equal three. And these values, of course, you can manipulate them, change them in whatever way that you wish.

Then get the students to discuss the relationship between the graph of f and the graph of an anti-derivative. And then of course you can add a bit more spice into it. Get students to find the volume. So in the next part I'll put there, the region between the y equal f, the line y equal four, the x-axis, the y-axis, is rotated about the y axis to form a solid revolution. Write down a definite integral in terms of x that gives the volume of solid formed and find its volume.

So you can see in this particular part of questions that I actually scaffold the questions more to give a good entry to students. The next part, keeping n equal one, and students can choose several suitable values of k to find f' and use the result to find an anti-derivative. And then the next part they can explore and discuss the effects on the derivative and anti-derivative of f when changing the values of k. Hopefully they realise that it doesn't make much difference at all.

So this comes to the end of my discussion of developing component one. In my next video I will discuss how I have developed component two of the application task.

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