This is Video 4, in writing an application task for Mathematical Methods. This time I'm talking about Component 3.

So Component 3 is where we actually move it a bit and allow the students space to investigate something that's different. So something that they can change. They can change the assumptions or the variables. They can change the constraints and the conditions. There might've been a question of interest that came up while they were doing it. And then, or that you could actually say as well, identify relevant content and then you can state the analysis that's required.

When I'm talking to teachers I often call this component the "what if" component? So I've done all of this work, I've done Component 1 with numbers, I've done Component 2 with parameters, and Component 3. What if I change something? Will it be interesting if I change this? Will it be interesting if I change the sign to a cos? Something as simple as that. Will it be interesting if I change the sine to a polynomial? And then do related analysis for it.

So you can do as much scaffolding as you like for this or you can allow the students to say themselves, "What if I change this?" So I'm looking again at the same situation but I'm looking at something a bit different. So this is the what if. These graphs are very interesting, and if you've worked with them before, you will get quite excited about them.

I've asked the students, so this is new. I've asked them to draw the graph of f with some values of A and k that they choose. But also I've introduced a new graph of g which is just the exponential part of the graph with the same values of A and k. And what's very interesting is that you've got, when you draw it, you've got your original drug concentration graph and then this Ae to the kt graph skims past it tangentially. So it becomes a tangent to the actual graph. So it's very interesting to look at.

And when students change their values of A and k, the usual assumption is at the point where the asymptotic graph is, is a tangent, they think that's the same as the maximum point. So it's a very interesting investigation, is not the same as the maximum point. And in fact, will be just after it. And so there's all sorts of investigations where you can say, "What is the gap?" "What is the horizontal distance between the maximum point of view, original f graph and where the g graph only touches the f graph once?" So it's actually quite a fascinating investigation.

So we're asking the students to discuss where these points of intersection exist in relation to the stationary points of the graph of f. And I would actually do, remember I said that these points always come up in terms of Pi. So I've changed my domain to Pi again for this lot before Pi. You could even say for what values of k is the distance Pi on 4, or Pi on 3, or 2 Pi on 3, or Pi on 2, or Pi on 8. You could actually look at the horizontal distance between where the maximum of the graph is and where the exponential graph skims past it.

Another point you could look at is actually instead of drawing Ae to the negative kt, you could draw Ae to the kt and see what happens when you take that negative off. So there's actually a lot to investigate there. So I would say that's the main "What if" question that I've written.

There is an alternative here that I've thought about. What about carrying out a similar analysis using horizontal translations or dilations of the graph. So if you look at the graph on the left, graph on the left I've actually, my blue graph is the original graph with values of A and k. In my red graph is moved 10 to the right. And then my green graph is moved 20 to the right. Then what would be interesting about these graphs is - where do they intersect? When is the drug beginning to fall in the patient's system and they need another dose to put it back up to its maximum point. And that would be a very interesting analysis.

The graph on the right, what I've done, is I've done the original graph that I've been talking about, and then I've dilated it from the Y axis to spread it out more. So that could be an investigation. We have the maximum points the same, but what happens to our points of inflection? So that's an alternative way that we can change the question considerably.

So that's Component 3, where we are changing things about the question where students can really do investigations. So what I'm looking at here is I've got graphs of product functions. I've got symbolic expressions and families of graphs, families of graphs where I've got A and k, I'm looking at appropriate domains and ranges. I'm looking at the effect of transformations of the graph on a function. If you would like to do that for your Component 3.

We've also got differentiation where we look at suitable constraints and conditions, how easy or difficult is it to do the differentiation, consider the tangential aspects of the product functions, so that's the first alternative that I discussed for Component 3. Why does that actually come across and hit it, not at the station point, just a little bit afterwards, and apply suitable constraints to carry out the computations.

So that's the end of the suggestions for Component 3.

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