This is video four in the videos about how to write a SAC in Mathematical Methods, Unit 4, this is the problem-solving or modelling task, and this is the functions, algebra and calculus task.

So this is Part 3 of the task where we state questions of interest, already we've done a lot of investigations, so in your minds, teachers' minds, and also in students' minds, there should be interesting things that are developing in our problem-solving cycle.

Remember our problem-solving cycle is we can start off easily, we can analyse some things and then some different questions will arise as we investigate the functions and the questions.

We're going to identify the new relevant content, and I'm going to show you the written version of Part 3. There will be a PDF version of this also on the VCAA website to match this video. And I wanted to raise this comment again, and it's an important paragraph. In mathematics problems are generated from issues, questions, conjectures, and hypotheses arising from a range of context. New problems may arise in their own right. So that's what I was saying. A student might think or wonder what if that happens or as a variation, reformulation, extension or generalisation of a known problem or class of problems.

So an example of extension would have been in my previous video about the composite functions, because that was an interesting extension. What I'm going to do now is I'm going to look at distances, which is also a reformulation or a variation of the hyperbola that we've already begun to look at.

So the questions of interest this time are, what is the distance to a point from the graph? We could look at, the area between the hyperbola and the horizontal axis over a given interval and max and min context within this environment. And to remind you again, we're looking at graphs of the form x-h, y-k is m for some constant m where the centre of the hyperbola is at the point where h,k are positive reals, h and k. So the centre of the hyperbola is the point where the asymptotes meet.

In this case, we're going to look specifically at the distance from a point to a graph, distance between points on opposite branches of the graph or the symmetrical branches, and the maxima and minima for distance problems. As Mathematical Methods students we're always very keen to look at maxima and minima contexts for lots of problems.

So let's start with a parametric version, but made simpler by the coefficient of x being one. So consider y equals x+b over x+c. So the first question would be, find in terms of the variables where B and C are positive rationals, find the distance from the origin. To some point x,y on the graph. Hence find the maximum or minimum distance from the origin to some point x,y on the graph. And you might begin to think if we can find a minimum, is it possible to find a maximum? That's an interesting question for the students to consider.

Then part C, we've got y equals x+b on x+c again, find in terms of the variables again, where b and c are positive rationals, the distance from the vertex of one branch, so the vertex of the graph of y equals one on x is the point 1,1. So it looks like the vertex is called where the graph looks like it turns around, although it's not a stationary point. So find in terms of the variables b and c the distance from the vertex of one branch to some point x,y on a symmetric branch. And then that can be swapped. You can look at one branch to another branch. Hence find the maximum and minimum distance from the vertex of one branch to some point x,y on its symmetric branch. And then explore which of the maximum and minimum distances exist. You will find the minimum will be a lovely relationship but the maximum won't exist, but it's worth the students exploring why that's the case.

The indicative content this time is, application of differentiation to graph sketching, identification of key features of graph, identification of local maximum values over an interval and application to solving problems and an identification of interval endpoint max and min values. And the topics are maximum minimum distance from the origin, maximum minimum distance between symmetric branches. So that's the end of the task, Part 3 of my theoretical problem-solving task.

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