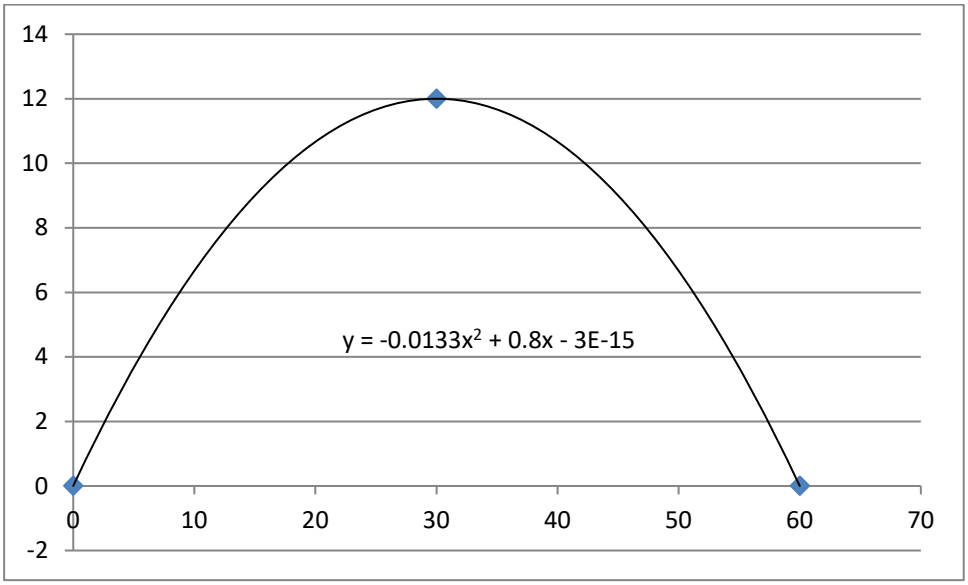
Student 3: Low Merit

NZQA Intended for teacher use only

The function that models the bridge needs to go through the points (0,0) and (30,12). Because the top of the bridge is at the point (30,12) it will be symmetrical about this point and the function will also go through (60,0).

I put these three points into Excel and fitted a quadratic model to them.

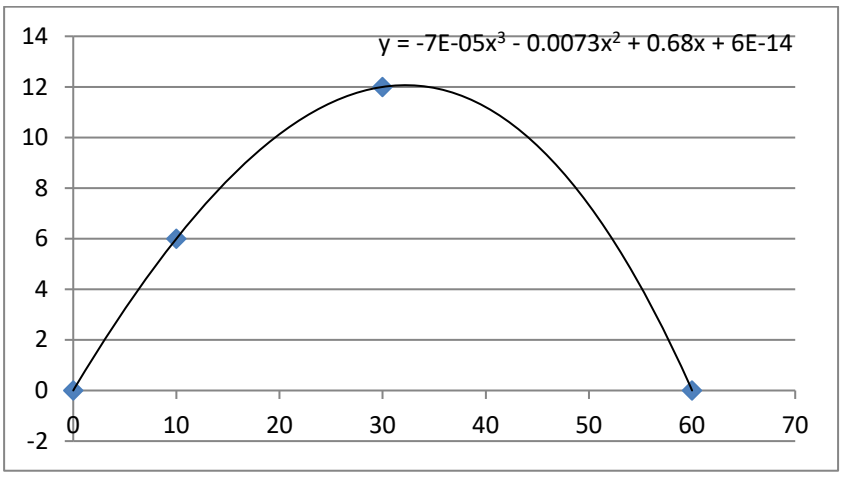


The equation of the function is $y = -0.0133x^2 + 0.8x$ as the constant is practically zero and I know it goes through the origin so it must be zero..

I only need the part of the function from x=0 to x= 30 so I will restrict the domain to these values.

This quadratic goes through these points, has a vertex at (30,12), is pointing down and has x=30 as an axis of symmetry.

I am also going to fit a cubic. I need at least four points to do this in Excel so I am going to estimate that the bridge also passes through (10,6). This looks a good idea from the graph above.



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This has equation $y = -0.00007x^3-0.0073x^2+0.68x$ The constant at the end is practically zero again and it needs to go through the origin so it must be zero. We need to restrict the values of x to between 0 and 30 again as we only want the first half of the bridge.

Cubics don't really have many features apart from the points where it crosses the axes which are (0,0) and (60,0). They are S shaped and don't have reflective symmetry. I would guess, but can't be sure, that this cubic has rotational symmetry about the origin. Cubics always have rotational symmetry but the centre changes from curve to curve.

I can't fit any of the other types of functions you suggest on Excel so I am not going to try a third one.

To complete the bridge we need functions that go from x = 30 to x = 60. They need to be the reflections of the first functions in x = 30 so the bridge is symmetrical about the top point.

The quadratic is easy because it is already symmetrical about the top so we can use the same function $y = -0.0133x^2 + 0.8x$ with x from 0 to 60. 2

The cubic looks nearly symmetrical about x = 30 too so we can use the same function 3

$y = -0.00007x^3-0.0073x^2+0.68x$ with x = 0 to x = 60.