Polynomial Functions - Part 1

Assessment OF Learning

In this assessment, you will take on the role of a roller coaster engineer. You are to create a roller coaster, its equation, and it associated graph. You must include all requirements along with a sketch/graph and equation of your roller coaster. The roller coaster can go above and/or below 'ground-level'. Assume the x-axis is 0 m above ground level and the y-axis is 0 m from the beginning.

Your roller coaster must be modelled by a polynomial function that:

- Is degree 3 or 4
- Has at least one double or triple root
- Has at least one positive and one negative x-intercept

In designing your roller coaster, you must answer the following questions:

1) What do you want the starting and ending behaviours of your roller coaster to look like and why? How can you ensure your function will accomplish these end behaviours?

2) Where do you want the roller coaster to be at ground-level and why? How can you ensure your function and its equation will accomplish this?

3) At these ground-level points, do you want the roller coaster to cross ground-level or just to touch it and why? How can you ensure your function will accomplish this?

4) Create an equation that can model your roller coaster. Write it in factored form.

5) Sketch your graph **without using technology** based on the end behaviours, leading coefficient, and x-intercepts and their orders.

6) Using technology such as www.desmos.com , graph the function you created in question 4.

7) Reflect on your graph in 6), is there anything you would change about your function? Explain why, or why not.

Category	Success Criteria	Levels	Comments
Knowledge	• Recognizes that the degree of a function affects end behaviours • Recognizes that the sign of the leading coefficient affects end behaviours • Recognizes that the x-intercepts affect the graph • Recognizes that the order of the roots affect the graph	L4: 80--100 Thorough/High Degree L3: 70--79 Considerable L2: 60--69 Some L1: 50--59 Limited	
Application	• Understands how the degree of a function affects ends behaviours • Understands how the sign of the leading coefficient affects end behaviours • Understands how the x-intercepts affect the graph • Understands how the order of the roots affect the graph	L4: 80--100 Thorough/High Degree L3: 70--79 Considerable L2: 60--69 Some L1: 50--59 Limited	
Thinking	• Uses all requirements when creating the roller coaster • Uses knowledge of polynomial functions to design a reasonable roller coaster	L4: 80--100 Thorough/High Degree L3: 70--79 Considerable L2: 60--69 Some L1: 50--59 Limited	
Communication	• Math notation is accurate and easy to follow • Explanation of choices clear and complete	L4: 80--100 Thorough/High Degree L3: 70--79 Considerable L2: 60--69 Some L1: 50--59 Limited	