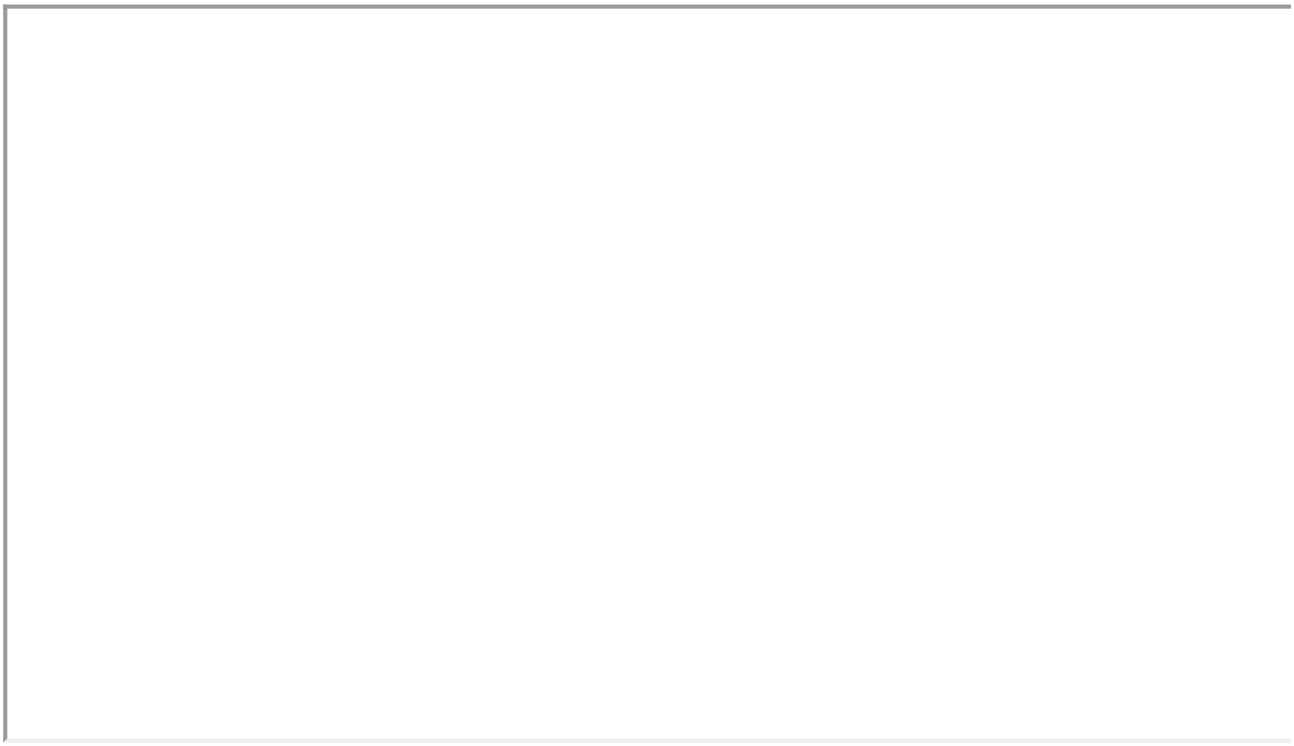
A-APR Graphing from Factors II

Alignments to Content Standards: A-APR.B.3

Task

Emery graphs the function f given by $f(x) = (x - 1)(x + 2)(x - 50)$ on his graphing calculator and gets the following graph.



He says "so, it's an upside down parabola."

a. Experiment with the viewing window to decide if Emery is correct.

b. Explain how you could choose a viewing window in advance that shows the main

features of the graph.

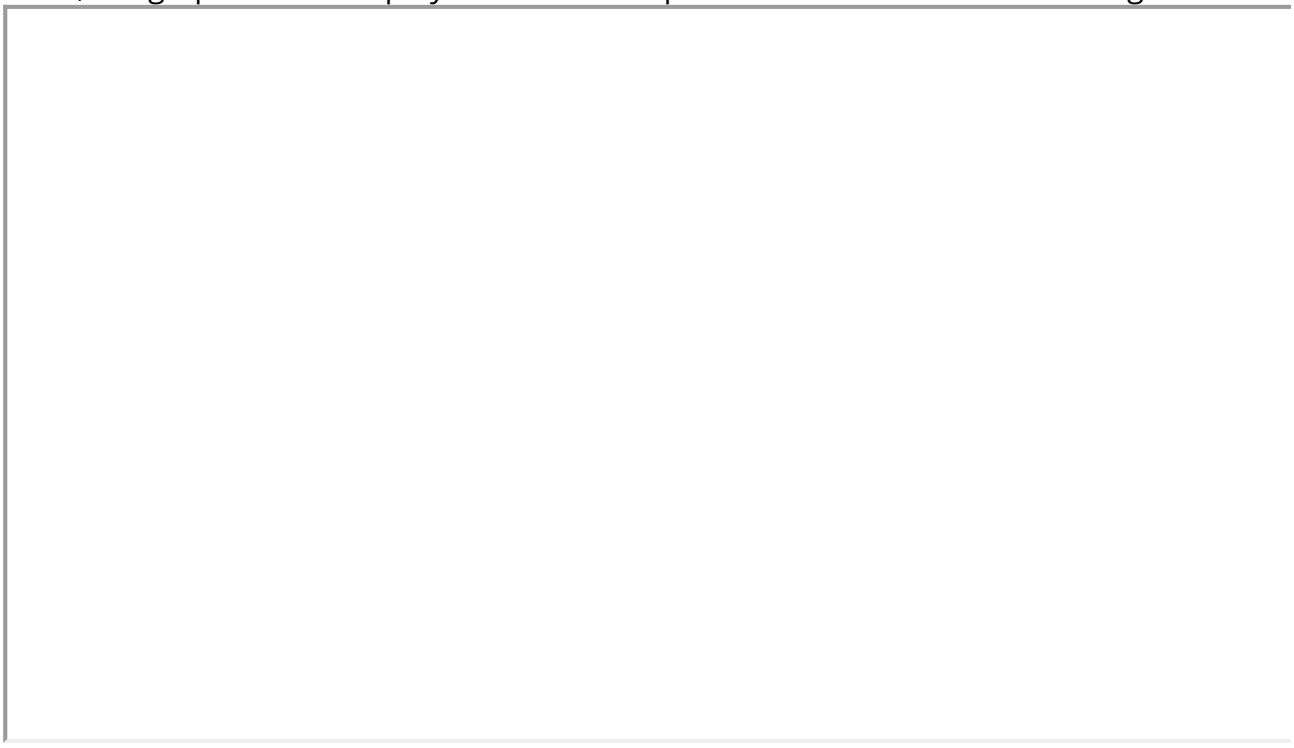
IM Commentary

The purpose of this task is to give students an opportunity to see and use the structure of the factored form of a polynomial (MP7). The factor $x - 50$ tells them that they should include $x = 50$ in the range on the x-axis. Students might also draw on their knowledge of the long run behavior of a cubic polynomial to recognize that Emery's graph must eventua return across the x-axis to the right of his current viewing window.

Edit this solution

Solution

a. No, the graph of a cubic polynomial is not a parabola. Here is a better viewing window:



b. Emery could have noticed that the polynomial has a factor $x - 50$ and therefore $y = 0$ when $x = 50$. This means the graph has to cross the x-axis at $(50, 0)$, so widening th

range on the x-axis to include $x = 50$ gives a better graph. A good corresponding range on the y-axis can be found by trial and error, or by reasoning that at $x = 25$ we have $y = 24 \times 26 \times -25 \approx -25^3 \approx -16,000$.