

M203: Polynomial and Rational Expressions, Functions, and Equations Pre-Badge Task

New Badge Alert!

This task will provide a preview of what we will be learning during the M203 - Polynomial and Rational Expressions, Functions, and Equations. You already know so much math, so use this task to share any understanding that you have before we start our learning. You will have a chance to do the same task at the end of the badge to see how your thinking has evolved.

The Task

QUESTION 1 Below are two graphs of polynomial functions.

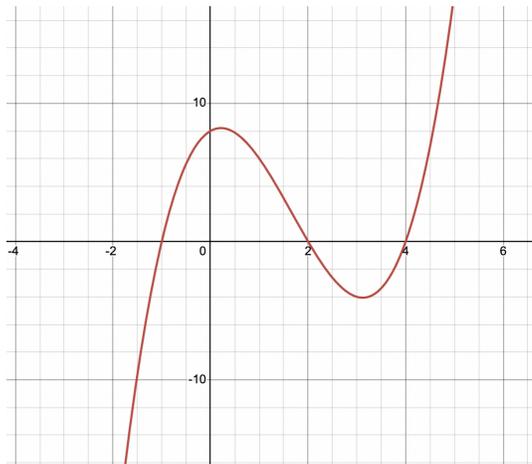
- Compare some of the key features of both graphs (including but not limited to their x-intercepts, end behavior, and general shape).
- Here are two polynomial functions, f and g , that correspond to the provided graphs. Identify which function corresponds to which graph and explain your reasoning.

$$f(x) = (x - 2)(x + 1)(x - 4)$$

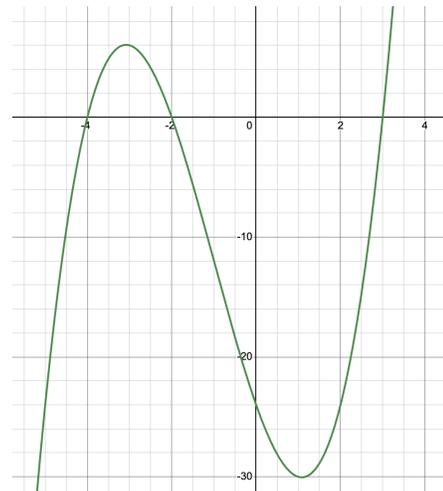
$$g(x) = x^3 + 3x^2 - 10x - 24$$



Graph 1:



Graph 2:



Key Feature Comparison:

Graph 1 Function:

Graph 2 Function:

Justification:

Justification:

QUESTION 2 The function $h(x)$ represents another polynomial function. Its graph indicates that it has the following features:

- A degree of 4
- Zeros at $x = -3$, $x = 1$, $x = 4$
- A negative leading coefficient
- A y-intercept of 12

Which of the following equations could represent $h(x)$? Explain your reasoning.



A. $h(x) = -(x + 3)(x - 1)(x - 4)(x + 2)$

B. $h(x) = -(x + 3)(x - 1)^2(x - 4)$

C. $h(x) = (x + 3)(x - 1)^2(x - 4)$

D. $h(x) = -2(x + 3)(x - 1)(x - 4)$

QUESTION 3 Amber drew a graph of a polynomial that has exactly five zeros. Using this information, answer the following questions:

- Amber is exploring ways to write a 5th degree polynomial using those five zeros. Write a 5th degree polynomial equation that has exactly five zeros.
- Amber is exploring other ways to write a polynomial using those five zeros, this time she wants to have a degree that is not 5. Is this possible? If so, provide an example.



QUESTION 4 Two competing businesses, Business K and Business J, tracked their yearly profits (in thousands of dollars) and found that the following models best fit their profits over the last year:

$$k(x) = x^3 + 5x^2 - 14x$$
$$j(x) = x^3 + 2x^2 - 3x - 36$$

- A. What do you **notice and wonder** about the two models? What information in the text above supports what you notice?
- B. How might you use these functions to compare the profits between Business K and Business J?
- C. Find the difference between k and j .
- D. The resulting polynomial is always positive; justify why this is. What does this tell you about the profits of Business K compared to Business J over the last year?