2.5 Families of Polynomial Functions Lesson

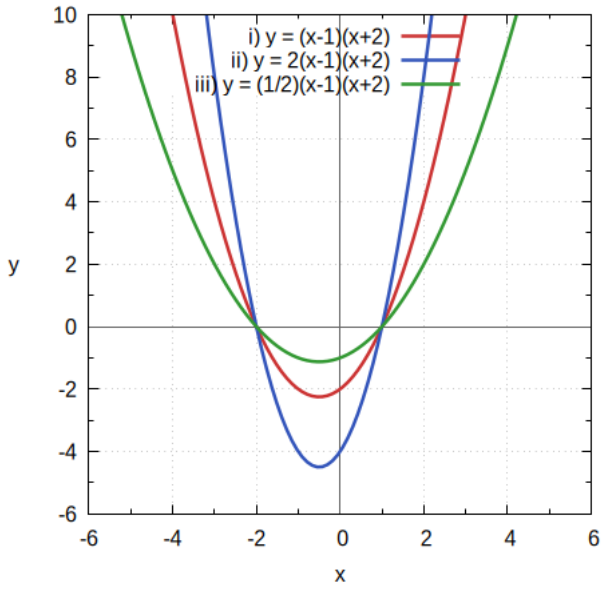
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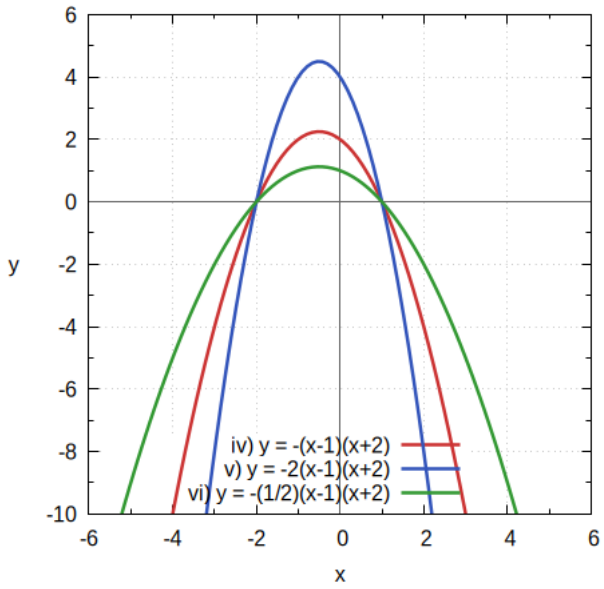
The course material originated from www.jensenmath.ca

In this section, you will determine equations for a family of polynomial functions from a set of zeros. Given additional information, you will determine an equation for a particular member of the family.

Part 1: Investigation

1)





a) How are the graphs of the functions similar and how are they different?

Same:

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Different:

b) Describe the relationship between the graphs of functions of the form $y = k(x - 1)(x + 2)$, where $k \in \mathbb{R}$

2)

a) Examine the following functions. How are they similar? How are they different?

i) $y = -2(x - 1)(x + 3)(x - 2)$

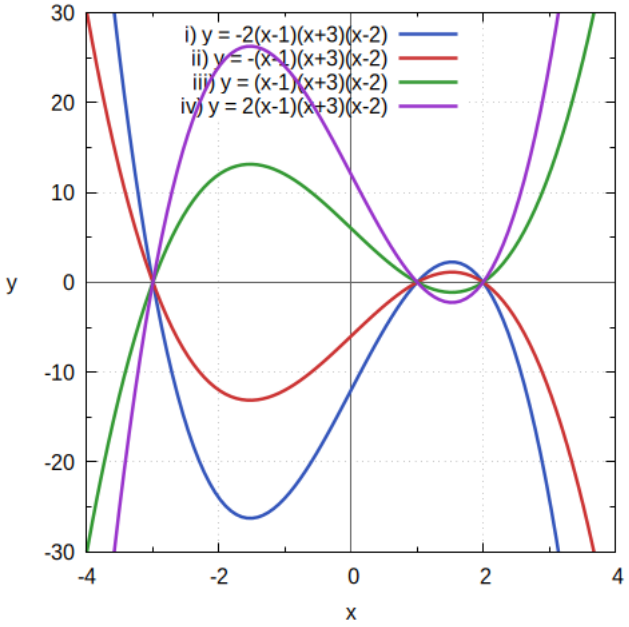
ii) $y = -(x - 1)(x + 3)(x - 2)$

iii) $y = (x - 1)(x + 3)(x - 2)$

iv) $y = 2(x - 1)(x + 3)(x - 2)$

b) Predict how the graphs of the functions will be similar and how they will be different.

c) Use technology to help you sketch the graphs of all four functions on the same set of axes.



A _____ of functions is a set of functions that have the same characteristics. Polynomial functions with the same _____ are said to belong to the same family. The graphs of polynomial functions that belong to the same family have the same x-intercepts but have different y-intercepts (unless 0 is one of the x-intercepts).

An equation for the family of polynomial functions with zeros $a_1, a_2, a_3, \ldots, a_n$ is:

$$y = k(x - a_1)(x - a_2)(x - a_3)\ldots(x - a_n), \text{ where } k \in \mathbb{R}, k \neq 0$$

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Part 2: Represent a Family of Functions Algebraically

1) The zeros of a family of quadratic functions are 2 and -3.

a) Determine an equation for this family of functions.

b) Write equations for two functions that belong to this family

c) Determine an equation for the member of the family that passes through the point $(1, 4)$.

2) The zeros of a family of cubic functions are -2, 1, and 3.

a) Determine an equation for this family.

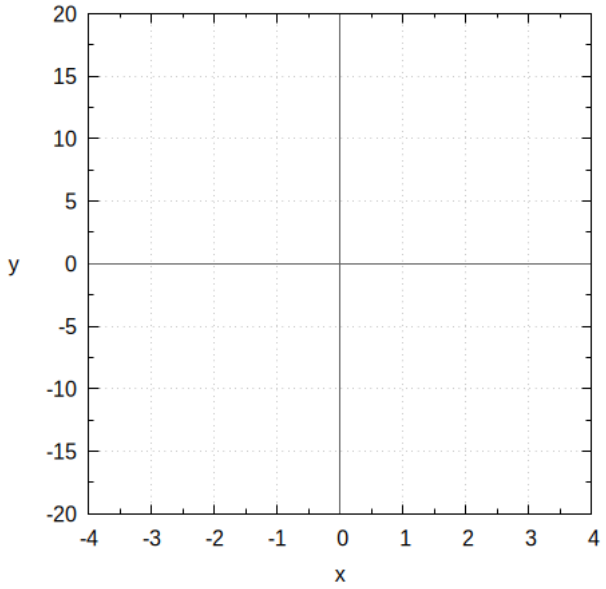
b) Determine an equation for the member of the family whose graph has a y-intercept of -15.

d) Sketch a graph of the function

To sketch a graph:

- Plot y-intercept
- Plot x-intercepts
- Use degree and leading coefficient to determine end behaviour

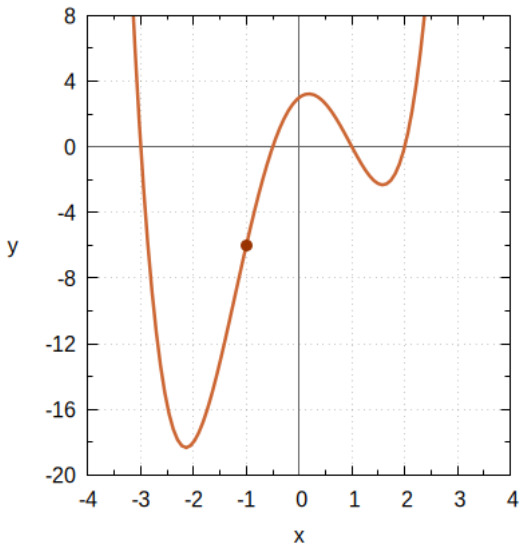
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3) Determine an equation for the family of cubic functions with zeros $3 \pm \sqrt{5}$ and $-\frac{1}{2}$

Part 3: Determine an Equation for a Function From a Graph

4) Determine an equation for the quartic function represented by this graph.



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