Section 2.4 Families of Polynomial Functions

- A **family of functions** is a set of functions with the **same characteristics**.

- Polynomial functions with the **same zeros** 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 **different y-intercepts** (unless zero is one of the x- intercepts).

- A family of polynomial functions with zeros a1, a2, a3,... an, can be represented by an equation of the form $f(x) = k(x - a_1)(x - a_2)(x - a_3)\ldots(x - a_n)$, where $k \in R, k \neq 0$.

- An equation for a particular member of a family of polynomial functions can be determined if a point on the graph is known.

Example: The zeros of a family of quadratic functions are -3 and 2.

a) Determine an equation for this family.

$f(x) = k(x + 3)(x - 2)$

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

$f(x) = 35(x + 3)(x - 2)$

$f(x) = -1(x + 3)(x - 2)$

c) Determine an equation for the member of the family whose graph has a y-intercept of -18.

$-18 = k(0 + 3)(0 - 2)$ x = 0 for y-intercept
$-18 = -6k$
$3 = k$

So $f(x) = 3(x + 3)(x - 2)$

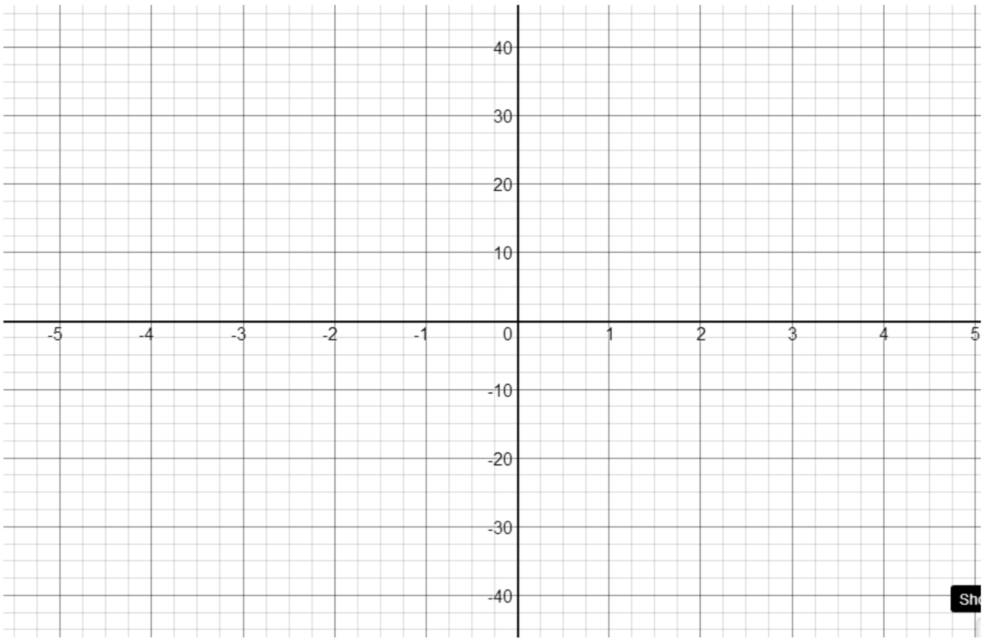
Example: The zeros of a family of cubic functions are -3, 1, and 4.

a) Determine an equation for this family.

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

c) Determine an equation for the member of the family whose graph has a y-intercept of -18.

d) Sketch graphs of the functions in parts b) and c).



Example:

a) Determine a simplified equation for the family of quartic equations with zeros at ±1 and $2 \pm \sqrt{3}$.

b) Determine an equation for the member of the family whose graph passes through the point (2, 18).

Example: Determine an equation for the quartic function represented by this graph.