

## Writing Polynomials Given Zeros

Recall: To multiply polynomials we can either distribute or use the box! Let's practice:

1.  $(x + 5)(x - 2)$

2.  $(x + 3)(x^2 + 4x - 6)$

3.  $x^3(x^2 + 4x - 6)$

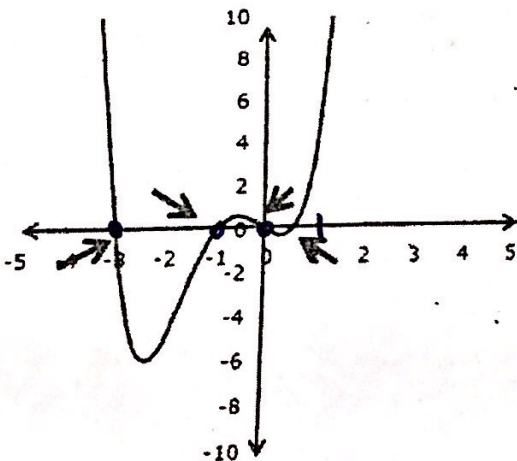
$$x^3 + 4x^2 - 6x + 3x^2 + 12x - 18$$

$$\boxed{x^3 + 7x^2 + 6x - 18}$$

How would you write a polynomial when given the zeros or roots? You work backwards.

- If the roots are  $x = -2, 1, -2/3$ , and  $0$  then the factors are the opposite:  $x(x+2)(x-1)(3x+2)$
- We can multiply ALL the factors together to make our function in Standard Form.

Example: If you are given the graph, find the zeros and write the function.



Step 1: List all the roots:  $-3, 0, -1, \frac{1}{2}$

Step 2: Write your roots as factors

$$x(x+3)(x+1)(2x-1) = 0$$

Step 3: Multiply

$$(x^2 + 3x)(x+1)(2x-1) = 0$$

$$(x^3 + x^2 + 3x^2 + 3x)(2x-1) = 0$$

$$(x^3 + 4x^2 + 3x)(2x-1) = 0$$

$$2x^4 - x^3 + 8x^3 - 4x^2 + 6x^2 - 3x = 0$$

Find the polynomial in STANDARD FORM based on the roots.  $\boxed{2x^4 + 7x^3 + 2x^2 - 3x = 0}$

1.  $2, -1, 0$

2.  $0$  (mult. 3),  $\frac{3}{2}, -4$

$$x(x-2)(x+1) = 0$$

$$x(x^2 + x - 2x - 2) = 0$$

$$x(x^2 - x - 2) = 0$$

$$\boxed{x^3 - x^2 - 2x = 0}$$

$$x^3(2x-3)(x+4) = 0$$

$$x^2(2x^2 + 8x - 3x - 12) = 0$$

$$x^2(2x^2 + 5x - 12) = 0$$

$$\boxed{2x^4 + 5x^3 - 12x^2 = 0}$$