End Behavior

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Warm-Up: Factor completely.

$x^5 - 4x^3 - x^2 + 4$

$x^3(x^2-4)-1(x^2-4)$

$(x^2-4)(x^3-1)$

$(x+2)(x-2)(x-1)(x^2+x+1)$

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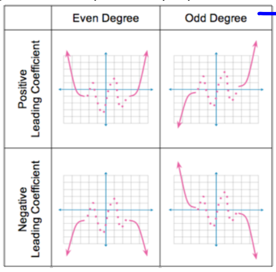
The degree (highest power) and leading coefficient (coefficient of the highest power) of a polynomial determine the **end behavior** for that polynomial.

There are four general shapes for polynomials.



→ opposite

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Without your calculator:
- a. state degree
- b. state the sign of the leading coefficient
- c. sketch (no graph paper) the end behavior

1. $P(x) = \underline{2x^3} - 3x^2 + 4x + 7$
   - a. 3 (odd)
   - b. +
   - c.

2. $P(x) = -4x^8 + 2x - 1$
   - a. 8 (even)
   - b. −
   - c.

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3. $P(x) = \underline{-6x^5} + 2x^2 - 3x$
   - a. 5 (odd)
   - b. −
   - c.

4. $P(x) = 3x^4 + 2x^3 - 4x - 5$
   - a. 4 (even)
   - b. +
   - c.

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So, what if our polynomial is in factored form?
How would we find the degree and leading coefficient?

add all the powers of x

see if any of the linear factors are negative.

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1. $P(x) = -x(x + 2)(x - 3)$

a. 3

b. −

c. 

2. $P(x) = -x(x - 1)^2(2x + 3)$

a. 1+2+1 : 4

b. −

c. 

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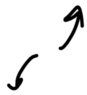
3. $P(x) = x^3(x + 2)(x - 1)$

a. 5

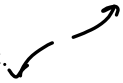
b. +

c. 

4. $P(x) = (x - 2)^2(x + 1)$

a. 3

b. +

c. 

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What else do we get from a polynomial in factored form?
the roots/zeros

Could we get a better sketch of our polynomial from factored form? How? Yes
use the zeros to sketch where the graph crosses the x-axis.

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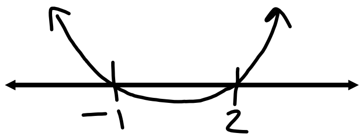
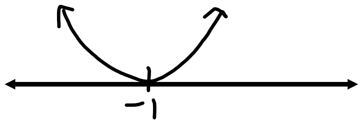
How would you sketch $y = (x + 1)(x - 2)$



How about $y = (x + 1)^2$



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