

## Graphing Polynomial Functions



## Keys to Graphing

- y-intercept
- x-intercept
- end behavior

## Preliminaries and Objectives

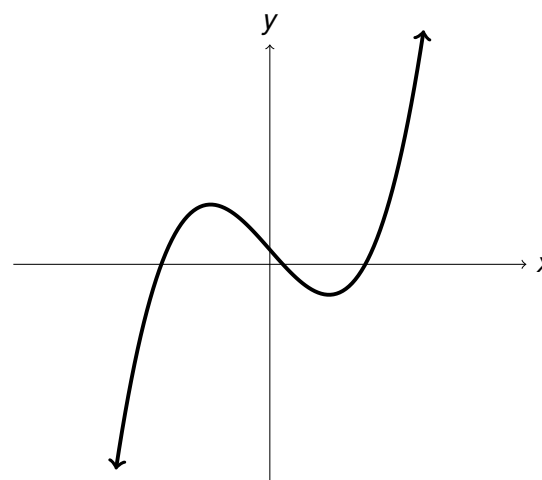
### Preliminaries

- Intercepts
- Factoring Polynomials

### Objectives

- Graph Polynomial Functions

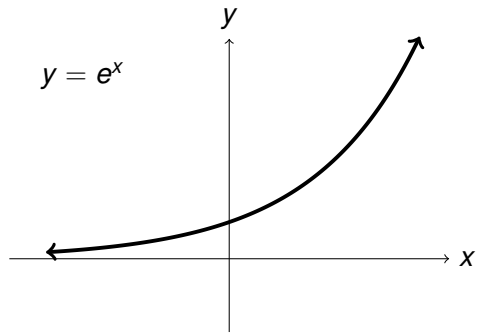
## End Behavior



$$\lim_{x \rightarrow \infty} f(x) = +\infty$$

$$\lim_{x \rightarrow -\infty} f(x) = -\infty$$

## End Behavior



$$\lim_{x \rightarrow \infty} e^x = +\infty$$

$$\lim_{x \rightarrow -\infty} e^x = 0$$

## End Behavior

$$\begin{aligned} f(x) &= x^3 + x^2 - 14x - 24 \\ &= (x - 4)(x + 3)(x + 2) \end{aligned}$$

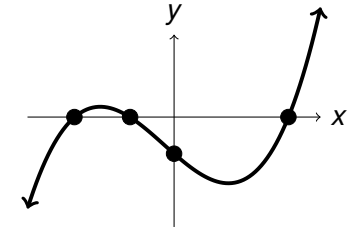
y-intercept :  $(0, -24)$

x-intercepts :  $(4, 0), (-3, 0), (-2, 0)$

end behavior :

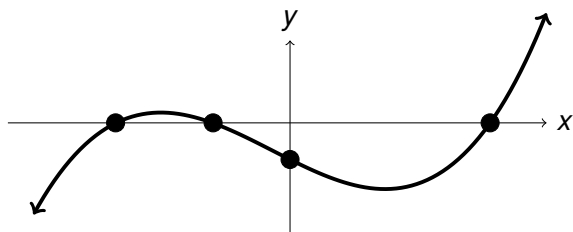
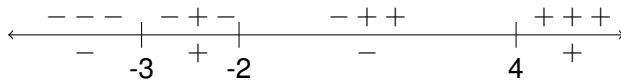
$$\lim_{x \rightarrow -\infty} f(x) = -\infty$$

$$\lim_{x \rightarrow \infty} f(x) = +\infty$$



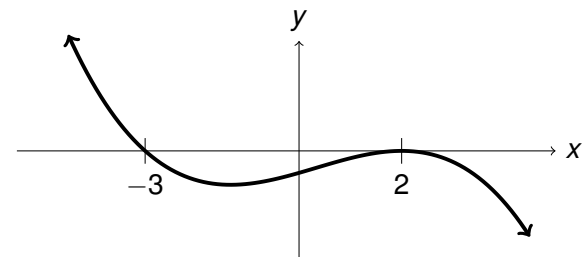
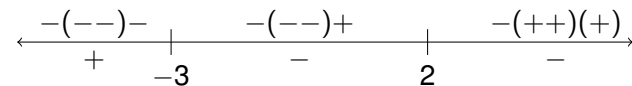
## Analyzing Factors

$$f(x) = (x - 4)(x + 3)(x + 2)$$



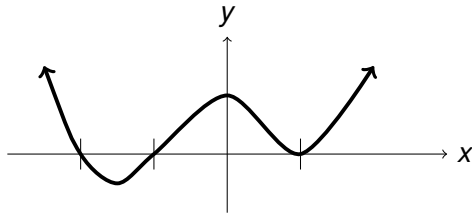
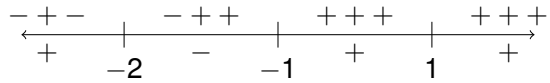
## Example 2

$$\begin{aligned} f(x) &= -(x - 2)^2(x + 3) \\ &= -x^3 + x^2 + 8x - 12 \end{aligned}$$



## Example 3

$$\begin{aligned} f(x) &= (x+1)^3(x-1)^4(x+2) \\ &= x^8 + x^7 - 5x^6 - 3x^5 + 9x^4 + 3x^3 - 7x^2 - x + 2 \end{aligned}$$



## Recap

To graph a polynomial

- Factor the polynomial to find the x-intercepts
- Plug in  $x = 0$  to find the y-intercept
- Analyze the end behavior and intervals where the function is positive and where it is negative