Graphing Polynomial Functions

UNIVERSITY OF MINNESOTA

Preliminaries and Objectives

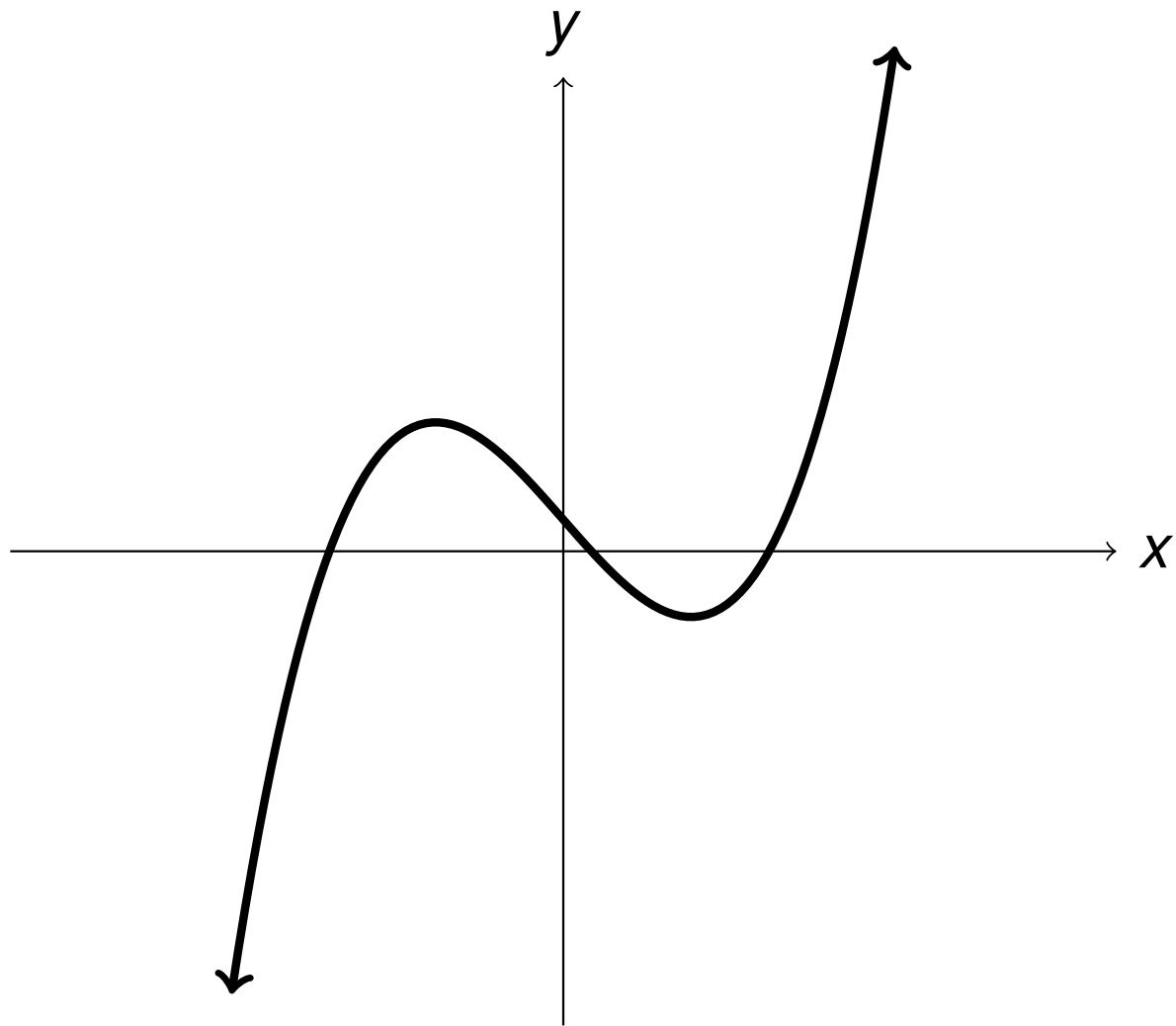Preliminaries

- Intercepts
- Factoring Polynomials

Objectives

- Graph Polynomial Functions

Keys to Graphing

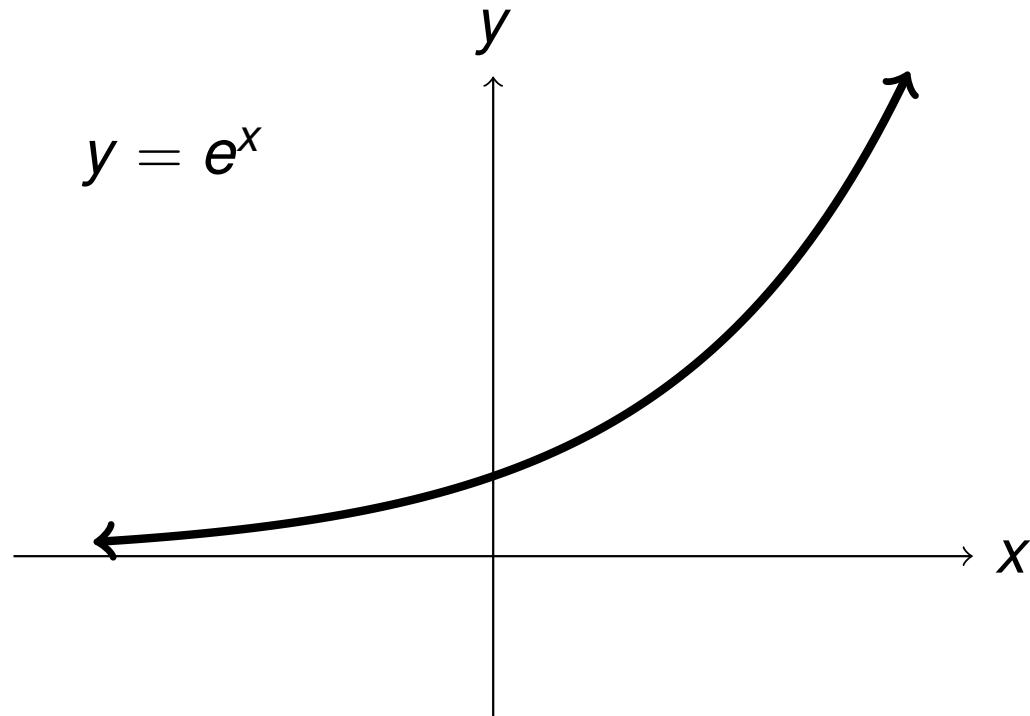- y-intercept

- x-intercept

- end behavior

End Behavior

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

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

End Behavior

$y = e^x$

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

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

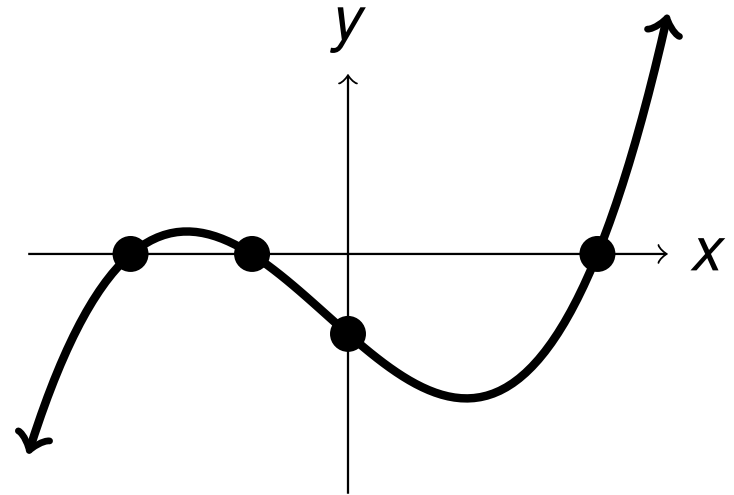# End Behavior

$$f(x) = x^3 + x^2 - 14x - 24$$
$$= (x-4)(x+3)(x+2)$$

y-intercept : $(0, -24)$
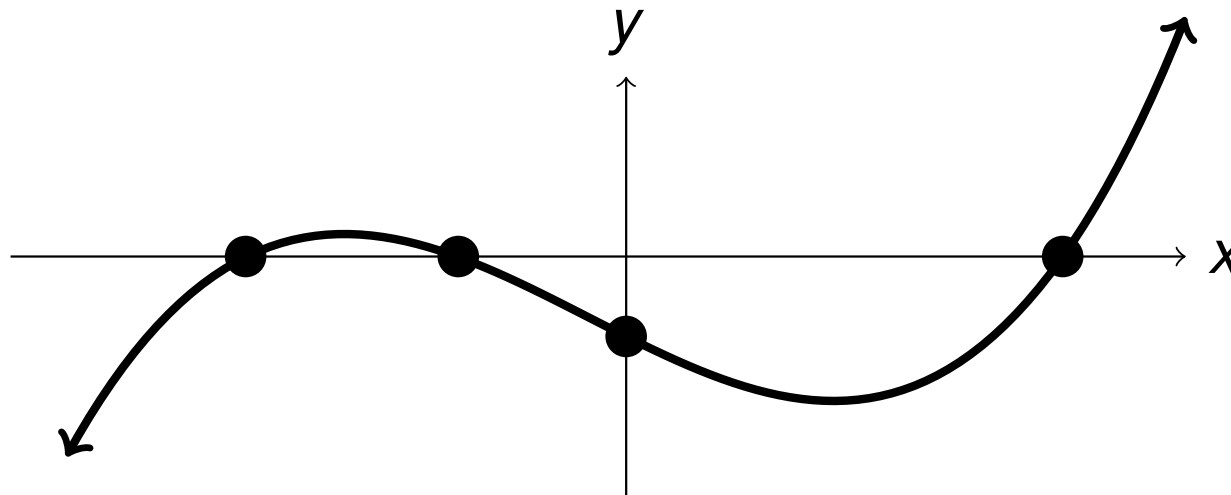
x-intercepts : $(4, 0), (-3, 0), (-2, 0)$

end behavior :

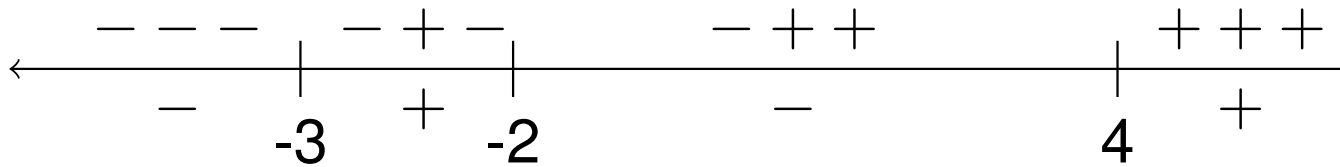$$\lim_{x \to -\infty} f(x) = +\infty$$
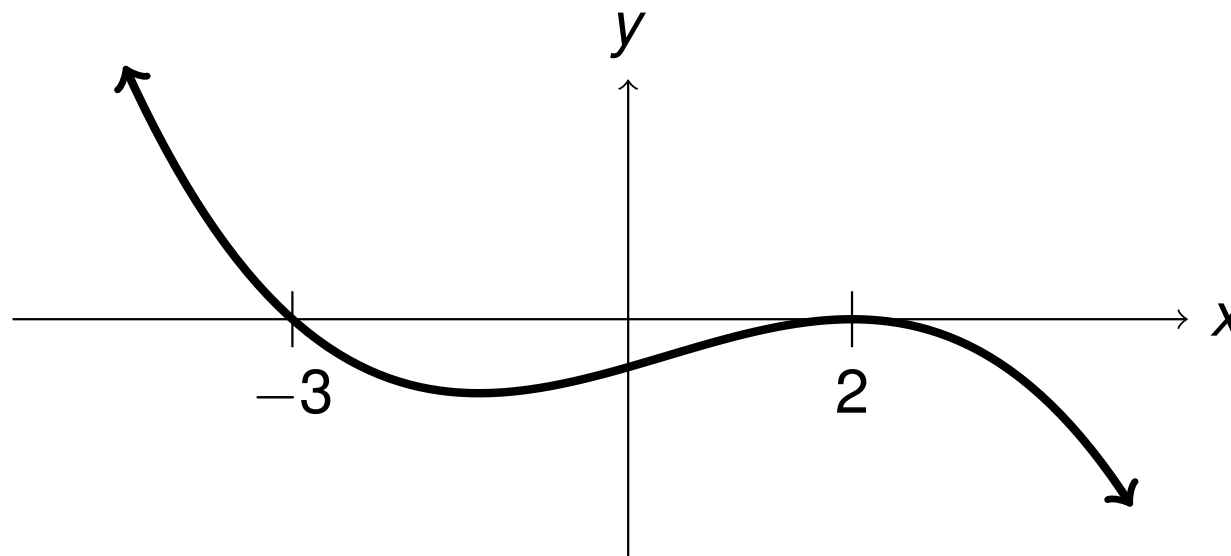
$$\lim_{x \to \infty} f(x) = -\infty$$

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

Example 2

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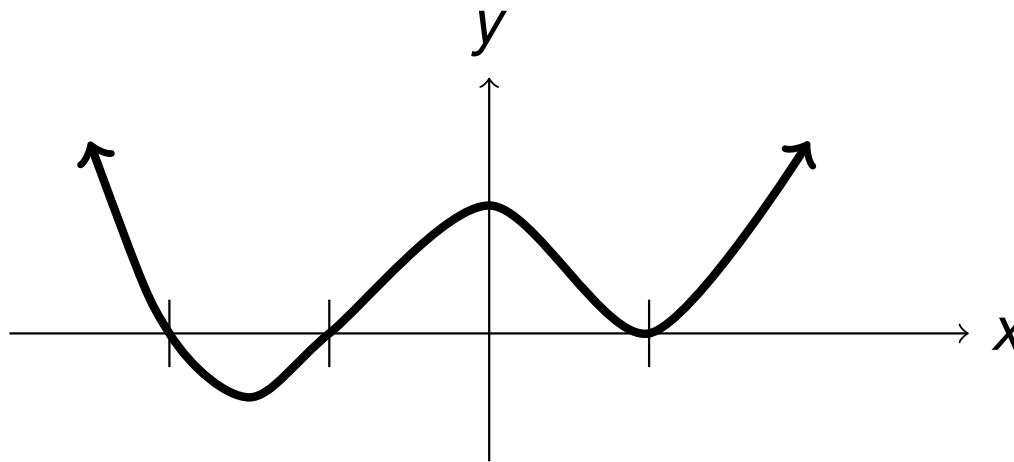$$= -x^3 + x^2 + 8x - 12$$

$$-(--)- \qquad -(--)+ \qquad -(++)(+)$$

$$+ \qquad\qquad - \qquad\qquad -$$

$$-3 \qquad\qquad 2$$
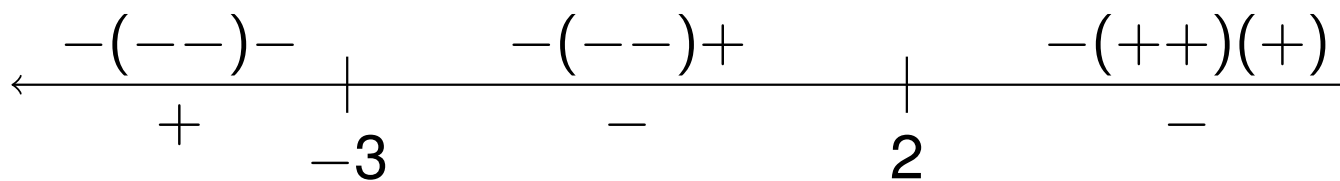
Example 3

$$f(x) = (x+1)^3(x-1)^4(x+2)$$
$$= x^8 + x^7 - 5x^6 - 3x^5 + 9x^4 + 3x^3 - 7x^2 - x + 2$$
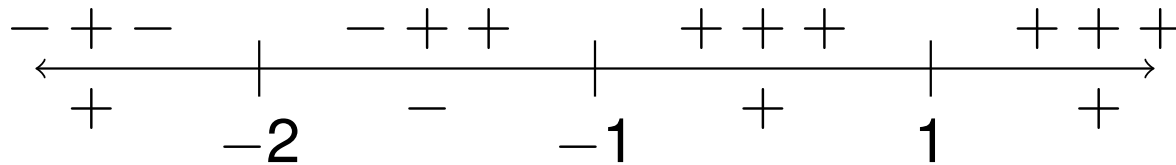
Recap

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