3.1 Polynomial Functions

Vocabulary pgs 16-167.

Polynomial function: a function in the form
\[ f(x) = a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} \ldots + a_0 \]

- \( n \) is a whole number and the coefficients are real numbers.
- Example: \( 3x^2 + 2x \)
- \( \frac{2}{x} + x^2 - 1 \)
- \( \sqrt{x} - 3x^2 \)

Degree of a polynomial function is the value of the highest exponent.

End behavior is what happens to the \( y \)-values as the \( x \)-values get very big.

Do the your turn on page 168.

- \( -2x^5 + 3x^2 + 4 \) the constant term is the \( y \)-intercept.

Degree 1:
- D: \( x \in \mathbb{R} \)
- R: \( y \in \mathbb{R} \)
- Positive slope
- Negative slope
- at most 1 \( x \)-int.

Degree 2:
- D: \( x \in \mathbb{R} \)
- R: \( y \in \mathbb{R} \)
- Positive: tails point up
- Negative: tails point down
- at most 2 \( x \)-ints.

Degree 3:
- D: \( x \in \mathbb{R} \)
- R: \( y \in \mathbb{R} \)
- at most 3 \( x \)-ints.

Degree 4:
- D: \( x \in \mathbb{R} \)
- R: \( y \leq \text{vertex} \) or \( y \geq \text{vertex} \)
To match equation to graphs.

1. Look at the y-intercept.
2. Look at the end behavior.
3. Look at the number of x-intercepts.

Page 112 - Your turn

\[ V(h) = h^3 + 10h^2 + 31h + 30 \]

a) \[ V(0) = 8^3 + 10(8)^2 + 31(8) + 30 \]
   \[ V = 1430 \text{ cubic inches} \]

b) least volume is 30 cubic inches if \( h = 0 \)
   but that's not realistic.

Page 114 1-4 ev. odd. let \( f, g, h \).