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## 6.2 Polynomial Key Features

Polynomial Functions	A polynomial function is a function of the form:	
	$f(x) = a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \dots + a_2 x^2 + a_1 x + a_0, \dots$ <p>The coefficients (<math>a_n, a_{n-1}, \dots, a_1, a_0</math>) are real numbers, <math>a_n \neq 0</math> and <math>n</math> is a positive integer. (<u>No negative exponents!</u>)</p> <p><math>a_n</math>: <u>the leading coefficient (when in standard form)</u></p>	
Monomial (polynomial)	Not a Monomial (not polynomial)	
<p>5      <math>x^1</math>      <math>-7xy</math>      <math>\frac{1}{2}x^4</math></p> <p>↑ constant</p> <p>↑ <math>x^1 y^1</math> product of #s and variables</p>	<p><math>-0.3x^{-2}</math>      <math>\frac{2}{x}</math>      <math> x+2 </math>      <math>\sqrt[3]{x}</math></p> <p><math>2x^{-1}</math>      <math>x^{\sqrt{3}}</math></p>	
Examples		
Function	Name by degree and terms <b>6.1</b>	Leading coefficient
$f(x) = -x^3 - x^2 + 8x + 1$	cubic 4 term polynomial	-1
$g(x) = 2\sqrt{x} + 3$	not a polynomial	
$t(x) = -5x + 1$	linear binomial	-5

Determine minimum degree:

Every direction is a degree (changing between increasing + dec. intervals)

End Behavior Pattern

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

Degree 2

two directions (2)

as  $x \rightarrow \infty, f(x) \rightarrow -\infty$

as  $x \rightarrow -\infty, f(x) \rightarrow -\infty$

$g(x) = 4x^4 + 6x^2 - x$

Degree 4

as  $x \rightarrow \infty, g(x) \rightarrow \infty$

as  $x \rightarrow -\infty, g(x) \rightarrow \infty$

$f(x) = 2x^2$

Degree 2

as  $x \rightarrow \infty, f(x) \rightarrow \infty$

as  $x \rightarrow -\infty, f(x) \rightarrow \infty$

$t(x) = x^3$  parent

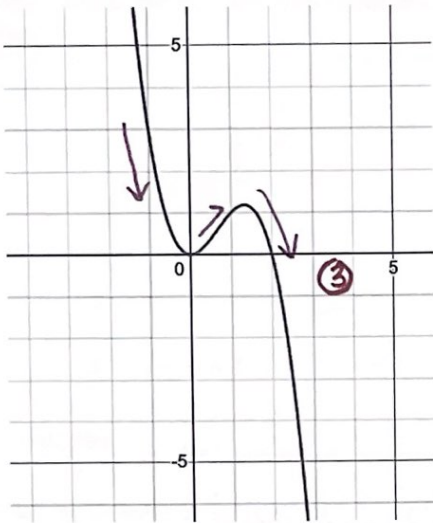
Degree 3

as  $x \rightarrow \infty, t(x) \rightarrow \infty$

as  $x \rightarrow -\infty, t(x) \rightarrow -\infty$

$$g(x) = -x^3 + 2x$$

Degree 3

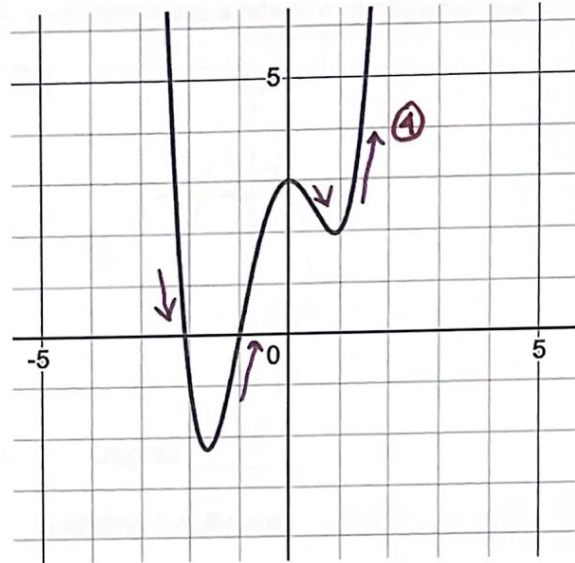


$$\text{as } x \rightarrow \infty, g(x) \rightarrow -\infty$$

$$\text{as } x \rightarrow -\infty, g(x) \rightarrow \infty$$

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

Degree 4



$$\text{as } x \rightarrow \infty, f(x) \rightarrow \infty$$

$$\text{as } x \rightarrow -\infty, f(x) \rightarrow \infty$$

End Behavior pattern	Even Degree	Odd Degree
Positive Leading Coefficient $+a_n$	<p>both ends</p>	
Negative Leading Coefficient $-a_n$		

See notes/practice 3.5 for refresher on increasing and decreasing intervals.