Honors Algebra II

Notes Section 2.2

Evaluate and Graph Polynomial Functions

VOCABULARY

Polynomial: a monomial or sum of monomials

Polynomial function: $f(x) = x^n + x^{n-1} + x^{n-2} \ldots x + c$

Leading coefficient: the # in front of the term with the highest exponent.

Degree: Sum of the exponents of a term

Constant Term: # without a variable

Standard Form: when terms are written in descending order by degree.

POLYNOMIAL FUNCTIONS

Degree	Type	Standard Form	Example
0	Constant	$f(x) = c$	_____
1	Linear	$f(x) = x + c$	_____
2	Quadratic	$f(x) = x^2 + x + c$	_____
3	Cubic	$f(x) = x^3 + x^2 + x + c$	_____
4	Quartic	$f(x) = x^4 + x^3 + x^2 + x + c$	_____

EXAMPLE 1 Decide whether the function is a polynomial function. If so, write it in Standard Form and state its degree, type, and leading coefficient.

a) $h(x) = x^4 - 1/4x^2 + 3$

Polynomial/Not a Polynomial

Standard Form: _____

Degree: _____

Leading Coefficient: _____

Type: _____

b) $g(x) = 7x - \sqrt{3} + \pi x^2$

Polynomial/Not a Polynomial

Standard Form: _____

Degree: _____

Leading Coefficient: _____

Type: _____

c) $h(x) = 5x^2 + 3x^{-1} - x$

Polynomial/Not a Polynomial

Standard Form: _____

Degree: _____

Leading Coefficient: _____

Type: _____

d) $k(x) = x + 2^x - 0.6x^5$

Polynomial/Not a Polynomial

Standard Form: _____

Degree: _____

Leading Coefficient: _____

Type: _____

EXAMPLE 2 Evaluate.

a) $f(x) = 2x^4 - 5x^3 - 4x + 8$

when $x=3$

b) $g(x) = x^3 - 5x^2 + 6x + 1$

when $x = 4$

Synthetic Division: a way to evaluate a polynomial function.

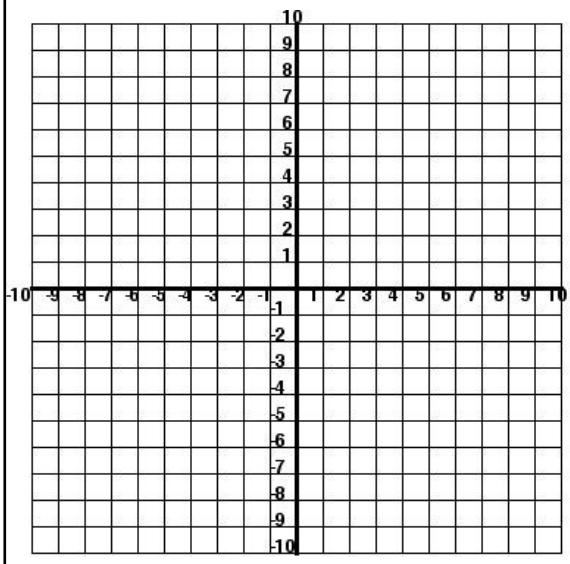
EXAMPLE 3 Use Synthetic Division to evaluate.

a) $f(x) = 2x^4 - 5x^3 - 4x + 8$ when $x=3$

b) $g(x) = x^4 + 2x^3 + 3x^2 - 7$ when $x = -2$

End Behavior: The behavior of the graph as x approaches $+\infty$ or $-\infty$.

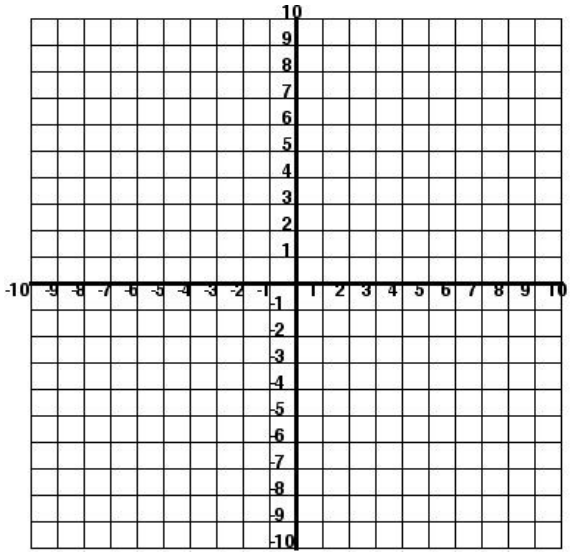
I. Degree: Odd
Leading Coefficient: Positive



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

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

II. Degree: Odd
Leading Coefficient: Negative

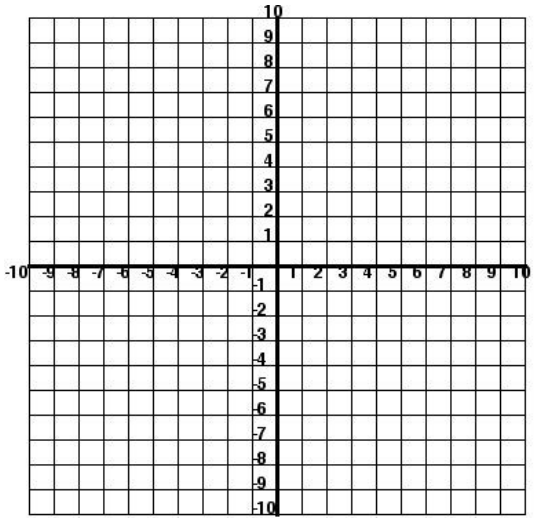


$f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$

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

III. Degree: Even

Leading Coefficient: Positive

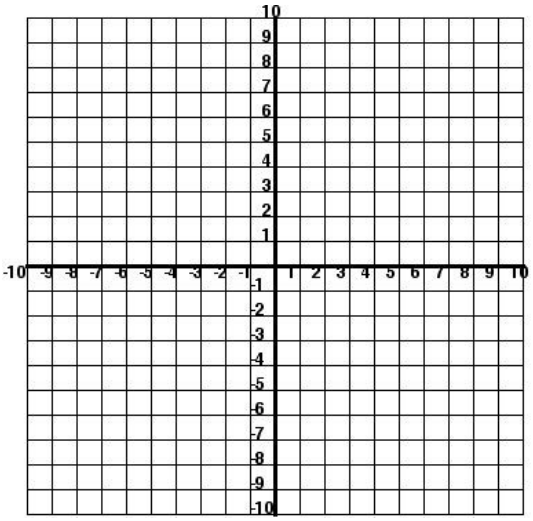


$f(x) \to +\infty$ as $x \to +\infty$

$f(x) \to +\infty$ as $x \to -\infty$

IV. Degree: Even

Leading Coefficient: Negative

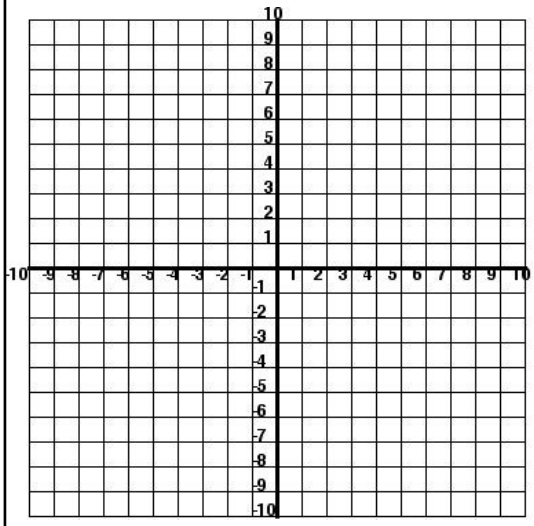


$f(x) \to -\infty$ as $x \to +\infty$

$f(x) \to -\infty$ as $x \to -\infty$

EXAMPLE 4 Graph.

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

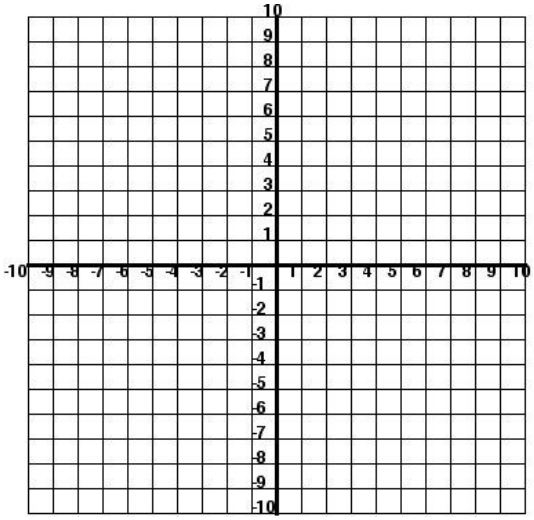


x	
y	

Degree: _____

Leading Coefficient: _____

b) $g(x) = x^4 - x^3 - 4x^2 + 4$



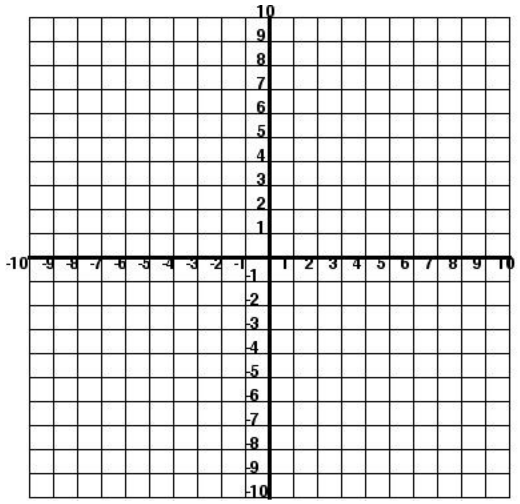
x	
y	

Degree: _____

Leading Coefficient: _____

EXAMPLE 5 What is the degree and sign of the leading coefficient for the polynomial functions?

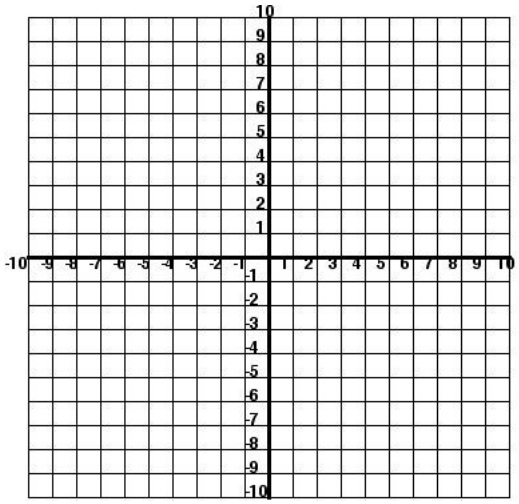
a)



Degree: _____

Leading Coefficient: _____

b)



Degree: _____

Leading Coefficient: _____

EXAMPLE 6 The energy E (foot-pounds) in each foot squared of a wave is given by the model $E=0.0029s^4$ where s is the wind speed (knots). Graph. Use the graph to estimate the wind speed needed to generate a wave with 1000 foot-pounds of energy/foot squared.