6.2 - Characteristics of Polynomial Functions

Monday, December 6, 2021 10:07 AM

6.2 - Character...

Y= -enter equation Window – size of window Graph – see the graph

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6.2 – CHARACTERISTICS OF THE EQUATIONS OF POLYNOMIAL FUNCTIONS

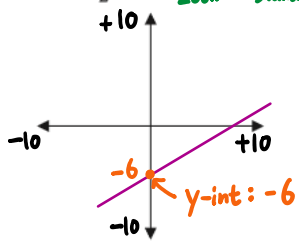
Standard Form: The standard forms for polynomial functions are:

Linear	*Quadratic*	*Cubic*
$f(x) = ax + b$, where $a \neq 0$.	$f(x) = ax^2 + bx + c$, where $a \neq 0$.	$f(x) = ax^3 + bx^2 + cx + d$, where $a \neq 0$.

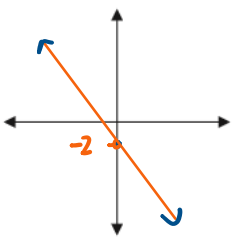
Observe the Characteristics of the Graphs of Polynomial Functions

Example 1: Sketch the graph on the grid using the graphing calculator window x: [–8, 8, 2] y: [–20, 20, 5]

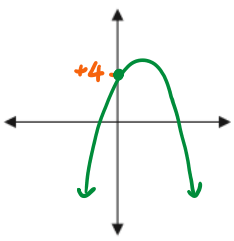
$f(x) = \frac{1}{2}x - 6$ (X,T,θ,n) Zoom - Standard



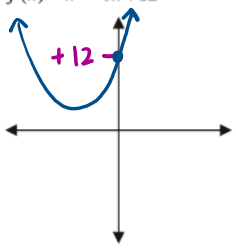
$f(x) = -5x - 2$ (-) Deg 1 y-int



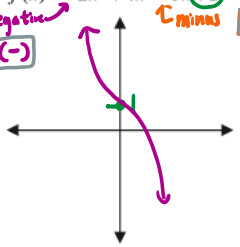
$f(x) = -2x^2 + 2x + 4$ Deg 2 ∩/∪ (-)



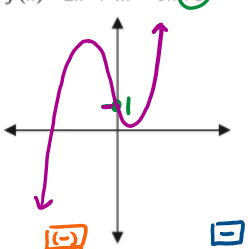
+ Deg 2 $f(x) = x^2 - 6x + 12$



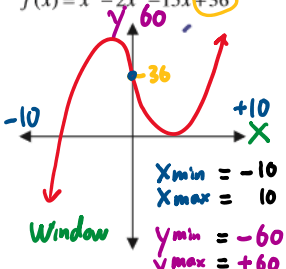
$f(x) = -2x^3 + 4x^2 - 3x + 1$ y-int (-) negative (-) minus



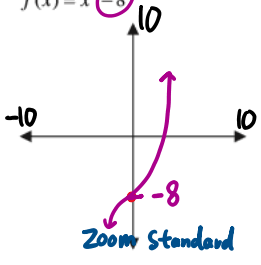
$f(x) = 2x^3 + 4x^2 - 3x + 1$



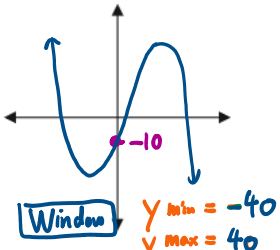
$f(x) = x^3 - 2x^2 - 15x + 36$



$f(x) = x^3 - 8$



$f(x) = x^3 + 2x^2 + 15x - 10$ (-) -



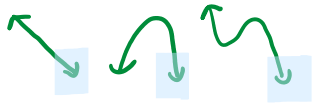
a. How is the constant term in a polynomial function related to the y-intercept of the graph of the function?

the constant term is the same as the y-intercept.

b. How does the sign of the leading coefficient affect the end behaviour of the graph of each type of polynomial function?

+ leading Coefficient → end in QI

– leading Coefficient → end in QIV



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(No G.C.)

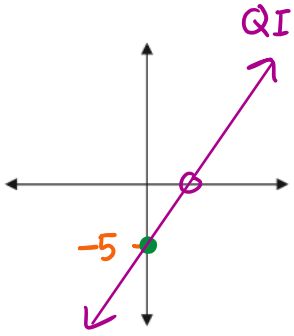
The *degree* of a polynomial function determines the *shape of the function*. The graphs of polynomial functions of the same degree have common characteristics.

Reason about the Characteristics of the Graph of a Given Polynomial Function Using Its Equation

Example 2: Predict the number of possible x-intercepts, y-intercept, domain, range, end behaviour, number of possible turning points of each function using its equation.

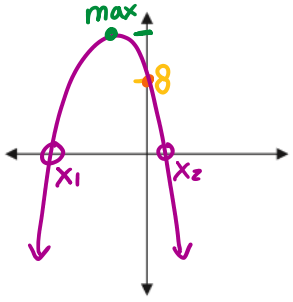
a. $f(x) = 3x - 5$ — y-int; Deg 1 +

x-intercepts	1 x-int
y-intercept	1 y-int @ y=-5
domain	$x \in \mathbb{R}$
range	$y \in \mathbb{R}$
end behaviour	QIII → QI
number of turning pts.	none



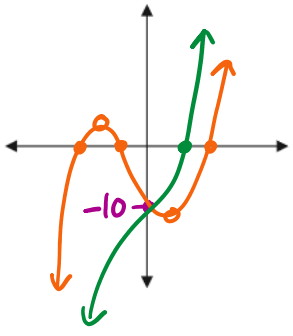
b. $f(x) = -2x^2 - 4x + 8$ — Deg 2 ⊖

x-intercepts	2 x-int
y-intercept	1 y-int @ y=8
domain	$x \in \mathbb{R}$
range	$y \leq$ max value
end behaviour	Q3 → Q4
number of turning pts.	1



c. $f(x) = 2x^3 + 10x^2 - 2x - 10$ — Deg 3 ⊕

x-intercepts	1 or 2 or 3 x-int
y-intercept	1 y-int @ y=-10
domain	$x \in \mathbb{R}$
range	$y \in \mathbb{R}$
end behaviour	Q3 → Q1
number of turning pts.	2 or None



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Connect Polynomial Functions to Their Graphs

Example 3: Match each graph with the correct polynomial function. Justify your reasoning.

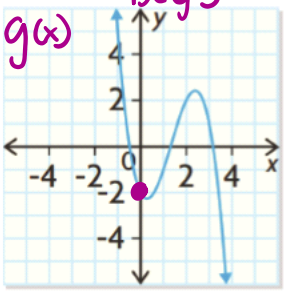
$g(x) = -x^3 + 4x^2 - 2x - 2$ $\quad j(x) = x^2 - 2x - 2$ $\quad p(x) = x^3 - 2x^2 - x - 2$

$h(x) = -\frac{1}{2}x - 3$ $\quad k(x) = x^2 - 2x + 1$ $\quad q(x) = -2x - 3$

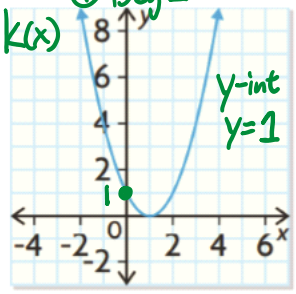
Q4 Q1

negative

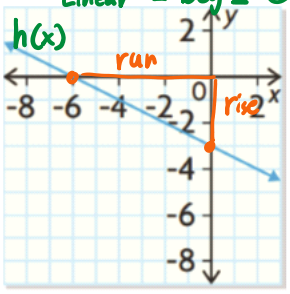
Deg 3



⊕ Deg 2



Linear = Deg 1 ⊖

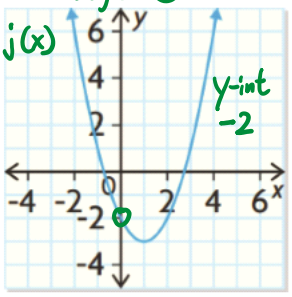


$m = \frac{\text{rise}}{\text{run}}$

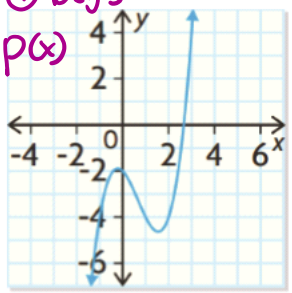
$m = \frac{-3}{6}$

$m = -\frac{1}{2}$

Deg 2 ⊕

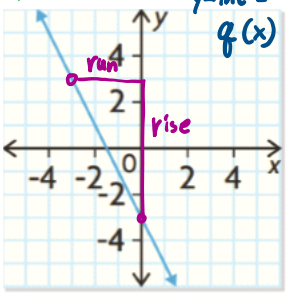


⊕ Deg 3



m = -2

y-int = -3



$m = \frac{\text{rise}}{\text{run}} = \frac{-6}{3}$

$m = -2$

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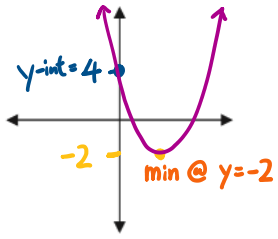
Reason about the Characteristics of the Graphs of Polynomial Functions

Example 4: Sketch the graph of a possible polynomial function for each set of characteristics below.

a. Range: $\{y \mid y \geq -2, y \in \mathbb{R}\}$ and y-intercept: 4



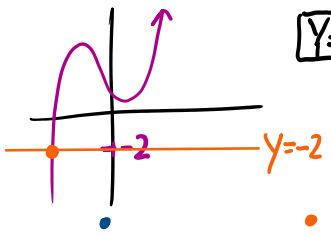
Q3, x = ___? y = -2

Y= Y2 = -2 Graph

2nd Calc 5: intersect

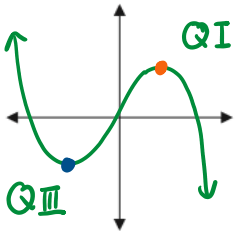
↓ move the point closer.

↓ Enter x 3

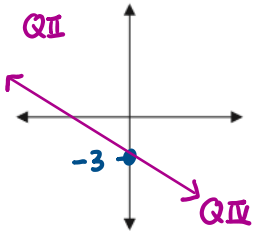


X = -2.745

b. Range: $\{y \mid y \in \mathbb{R}\}$ and turning points: one in quadrant III and another in quadrant I



c. Extending from quadrant II to quadrant IV, degree 1, y-intercept of –3



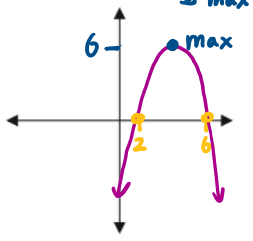
How to get (x) and (y) values?

$y = 2x^3 + 4x^2 - 3x + 1$

Zoom Standard to reset the window

↳ Graph

d. Range: $\{y \mid y \leq 6, y \in \mathbb{R}\}$ and x-intercept: 2 and 6



Q1, x = -1 y = 6 ?

table

or

from Graph

2nd Calc : 1 Value

x = -2 y = 7

x = ∅ y = 1 ?

Assignment: p. 393 #4 – 11, 13