6.2 Characteristics of Polynomial Functions

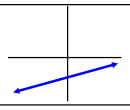
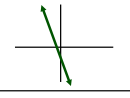
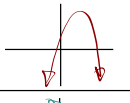
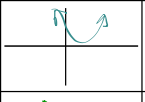
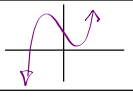
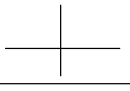
general (standard) form: linear - $y = mx + b$
quadratic - $y = ax^2 + bx + c$
cubic - $y = ax^3 + bx^2 + cx + d$

leading coefficient: the coefficient of the term with the greatest degree in a polynomial function... this coefficient determines the end behaviour of the graph

ex. $f(x) = 3 - 2x^3$ ∴ E.B. is QII → QIV

ex. $g(x) = -x^2 - 5x + 1$ (implied = 1) ∴ E.B. is QII → QI

Investigate the math pg. 384 - record your answers in the table below.

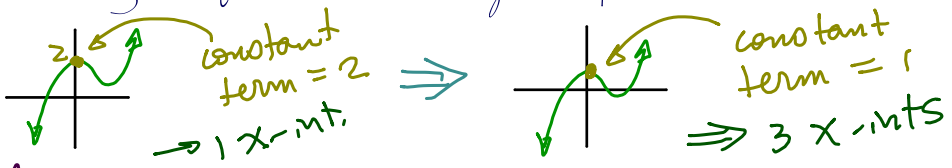
equation	sketch	degree	Number of x-ints	y-int	end behaviour	domain	range	# of turning points
$f(x) = \frac{1}{2}x - 6$		1	1	-6	III → I	$x \in \mathbb{R}$	$y \in \mathbb{R}$	0
$f(x) = -5x - 2$		1	1	-2	II → IV	$x \in \mathbb{R}$	$y \in \mathbb{R}$	0
$-2x^2 + 2x + 4$		2	2	4	III → IV	$x \in \mathbb{R}$	$y \leq 4.5$	1
$x^2 - 6x + 12$		2	0	12	II → I	$x \in \mathbb{R}$	$y \geq 3$	1
$-2x^3 + 4x^2 - 3x + 1$		3	1	1	II → IV	$x \in \mathbb{R}$	$y \in \mathbb{R}$	0
$2x^3 + 4x^2 - 3x + 1$		3	1	1	III → I	$x \in \mathbb{R}$	$y \in \mathbb{R}$	2
								
								
								

B. constant term = y-intercept

C.

leading coeff.	odd	even
+	III → I	II → I
−	II → IV	III → IV

D. leading coefficient, degree, constant term

E. 

F. changing the sign of the leading coefficient causes a reflection about the x-axis → E.B. is also reflected vertically

G. → max # x-ints = degree max # turning points = degree − 1

EXAMPLE 2 Connecting polynomial functions to their graphs

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

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

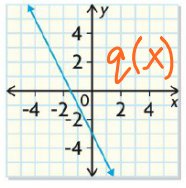
$h(x) = -\frac{1}{2}x - 3$

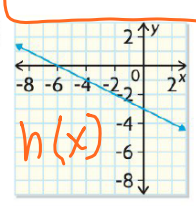
$j(x) = x^2 - 2x - 2$ (quadratic)

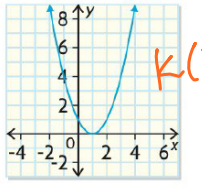
$k(x) = x^2 - 2x + 1$

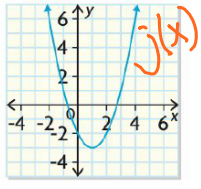
$p(x) = x^3 - 2x^2 - x - 2$

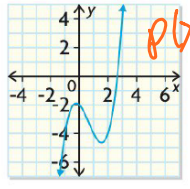
$q(x) = -2x - 3$

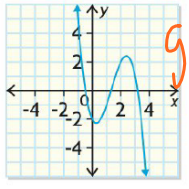
i) 

iii) 

v) 

ii) 

iv) 

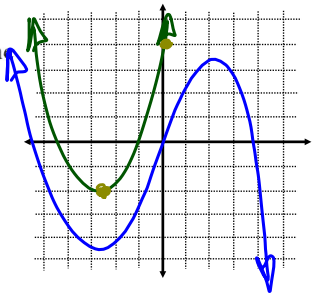
vi) 

EXAMPLE 3 Reasoning about the characteristics of the graphs of polynomial functions

Sketch the graph of a possible polynomial function for each set of characteristics below. What can you conclude about the equation of the function with these characteristics?

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

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



Homefun: pg. 393 #1, 3-8, 13, 14, 16