Last lesson we investigated polynomial functions by looking at a graph. In this lesson, we are asked to match graphs to their equations as well as determine characteristics without graphing. There are some important things to remember.
When a polynomial function is in standard form:

- The maximum number of x-intercepts the graph may have is equal to the degree of the function.
- The maximum number of turning points the graph may have is equal to one less than the degree of the function.
- The degree and leading coefficient indicate the end behaviour of the graph of the function.
- The y-intercept of the graph is equal to the constant term of the function.

The standard form of polynomial functions can be written in the following ways:

- If linear, $f(x) = ax + b$
- If quadratic, $f(x) = ax^2 + bx + c$
- If cubic, $f(x) = ax^3 + bx^2 + cx + d$

Linear and cubic polynomial functions have similar end behaviour.

- Negative leading coefficient: the graph extends from Quadrant II to Quadrant IV
- Positive leading coefficient: the graph extends from Quadrant III to Quadrant I

Quadratic polynomial function have a different end behaviour.

- Negative leading coefficient: the graph extends from Quadrant III to Quadrant IV
- Positive leading coefficient: the graph extends from Quadrant II to Quadrant I

In your descriptions of characteristics of a function we must include the number of x-intercepts, the y-intercept, end behaviour, domain, range, and the number of possible turning points.

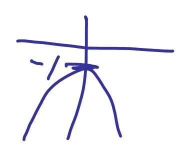
Example 1: Determine the characteristics of each function, using only its equation.

a) $f(x) = 4x^1 + 2$

- degree: 1
- leading coefficient: 4
- constant term: 2
- number of x-intercepts: 1
- y-intercept: 2 $= 4(0) + 2$
- extends from Quad III to Quad I
- domain: $x \in \mathbb{R}$
- range: $y \in \mathbb{R}$
- number of turning points: 0

(b) $f(x) = -5x^2 + 2x - 1$

- degree: 2
- leading coefficient: -5
- constant term: -1
- number of x-intercepts: 0
- y-intercept: -1
- extends from Quad III to Quad IV
- domain: $x \in \mathbb{R}$
- range: $y \leq -1$
- number of turning points: 1



Example 2: Match each graph to the correct polynomial function.

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

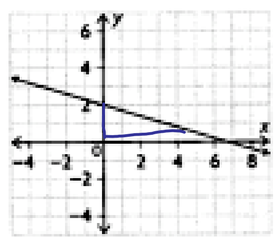
(ii) $g(x) = 3x + 2$

(iii) $h(x) = -0.3x + 2$

(iv) $j(x) = x^3 + x^2 + 2x + 2$

(iii)
-ve

A.



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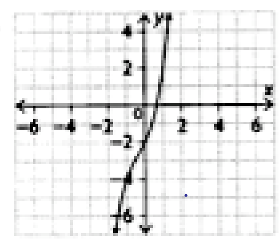
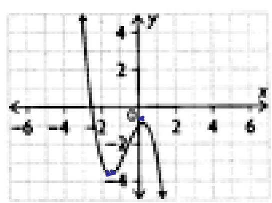


3 (iv)
+ve

(i) -ve
3

B.



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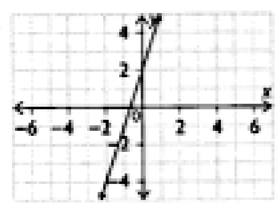

(ii)