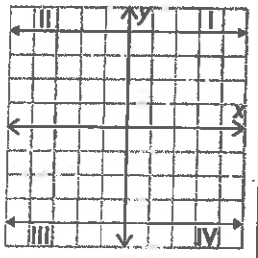
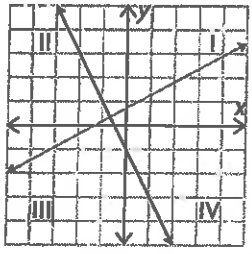
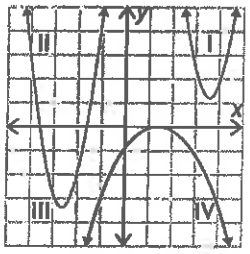
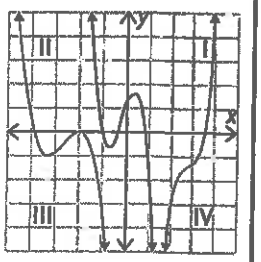
Name: _____ Date: _____

6.1 Exploring the Graphs of Polynomial Functions

YOU WILL NEED
- graphing technology

Keep in Mind

- A polynomial function in one variable contains only the operations of multiplication and addition, with real-number coefficients and whole-number exponents. The degree of a function in one variable is the greatest exponent. For example, $y = x^3 + 2x^2 - x + 4$ is a degree 3 polynomial function.
- The degree of a polynomial function indicates the shape of the function.

Function Type	constant	linear	quadratic	cubic
Degree, n	0	1	2	3
Sketch				
Number of x-intercepts	0 (except $y = 0$)	1	0, 1, or 2	1, 2, or 3
y-intercepts	1	1	1	1
Turning Points	0	0	1	0 or 2
End Behaviour	extends from Quadrant II to Quadrant I or from Quadrant III to Quadrant IV	extends from Quadrant III to Quadrant I or from Quadrant II to Quadrant IV	extends from Quadrant II to Quadrant I or from Quadrant III to Quadrant IV	extends from Quadrant III to Quadrant I or from Quadrant II to Quadrant IV
Domain	$\{x \mid x \in R\}$	$\{x \mid x \in R\}$	$\{x \mid x \in R\}$	$\{x \mid x \in R\}$
Range	$\{y \mid y = c, y \in R\}$	$\{y \mid y \in R\}$	$\{y \mid y \leq$ maximum, $y \in R\}$ or $\{y \mid y \geq$ minimum, $y \in R\}$	$\{y \mid y \in R\}$

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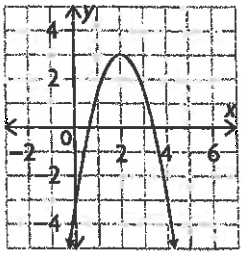
3. Determine the maximum or minimum value, the vertex, the axis of symmetry, the direction of opening, and the y-intercept of each quadratic function.

a)



b) $y = 3(x + 1)^2 + 4$

4. For each function, do the following:

- State whether the graph is a line or a parabola.
- If the graph is a line, state whether it is increasing, decreasing, or constant.
- If the graph is a parabola, state the direction of opening and the maximum or minimum value.
- State the y-intercept of the graph.

a) $y = 0.4(x - 5)^2 - 3$

b) $y = -1.6x + 5$

c) $y = -3(x - 4)(x + 2)$

d) $y = -2$

5. State, with reasons, whether each table of values represents a linear function, a quadratic function, or neither.

a)

x	−1	0	1	2	3	4
y	6	1	−2	−3	−2	1

b)

x	−3	−2	−1	0	1	2
y	−1	0	3	4	2	0

c)

x	−2	−1	0	1	2	3
y	7	5	3	1	−1	−3

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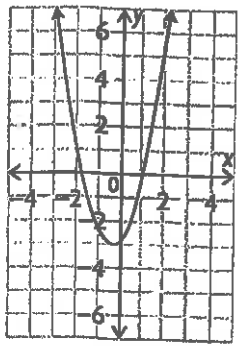
Example

Determine which of graphs A and B could represent polynomial functions.

A.



Solution

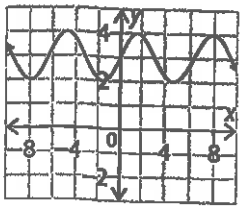
Step 1. I examined Graph A.

- It has two x-intercepts, one y-intercept, and one turning point.
- It extends from Quadrant II to Quadrant I.
- The domain is $\{x \mid x \in R\}$ and the range is $\{y \mid y \geq -3, y \in R\}$.

A graph that represents a quadratic function has all of these characteristics, so Graph A could represent a polynomial function.

Step 2. I examined Graph B.

B.



Graph B appears to represent a polynomial function in these ways:

- It has one y-intercept.
- It extends from Quadrant II to Quadrant I.
- The domain is $\{x \mid x \in R\}$.

However, Graph B does not represent a polynomial function in these ways:

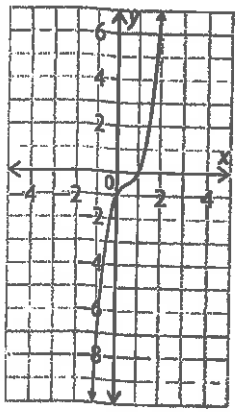
- It has no x-intercepts.
- Its range is $\{y \mid 2 \leq y \leq 4, y \in R\}$.
- It has many turning points.

This graph has some characteristics of a polynomial function, but not all of them, so it could not represent a polynomial function.

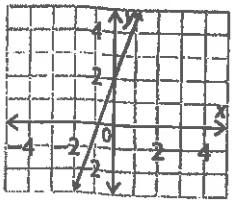
Practice

1. Determine which graphs represent polynomial functions, and of what types. Explain how you decided.

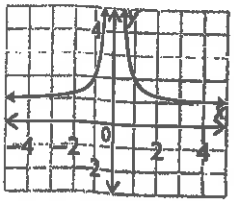
a)



b)



c)



b)

c)