

Chapter 6: Polynomial Functions

Lesson 6.1: Exploring the Graphs of Polynomial Functions, page 383

1. **a)** This is not a polynomial function since the graph has infinitely many turning points.
- b)** This is a polynomial function since the graph extends from quadrant II to quadrant I, it has 1 y -intercept, 1 turning point and 2 x -intercepts. It is a quadratic function.
- c)** This is a polynomial function since the graph extends from quadrant III to quadrant I, it has 1 y -intercept, 2 turning points and 3 x -intercepts. It is a cubic function.
- d)** This is a polynomial function since the graph extends from quadrant II to quadrant IV, it has 1 y -intercept, no turning points and 1 x -intercept. It is a linear function.
- e)** This is not a polynomial function because it has no x -intercepts and it is not a constant function.
- f)** This is not a polynomial function since the domain of this graph is not $\{x \mid x \in \mathbb{R}\}$.

2. **b)** x -intercepts: $-5, -1$

y -intercept: 2

End behaviour: curve extends from quadrant II to quadrant I

Domain: $\{x \mid x \in \mathbb{R}\}$

Range: $\{y \mid y \geq -2.5, y \in \mathbb{R}\}$

Number of turning points: 1

c) x -intercepts: $-2, -1, 1$

y -intercept: -5

End behaviour: curve extends from quadrant III to quadrant I

Domain: $\{x \mid x \in \mathbb{R}\}$

Range: $\{y \mid y \in \mathbb{R}\}$

Number of turning points: 2

d) x -intercept: 0.5

y -intercept: 2

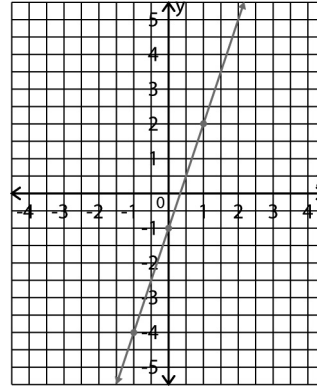
End behaviour: line extends from quadrant II to quadrant IV

Domain: $\{x \mid x \in \mathbb{R}\}$

Range: $\{y \mid y \in \mathbb{R}\}$

Number of turning points: 0

3. **a)**



Number of x -intercepts: 1

y -intercept: -1

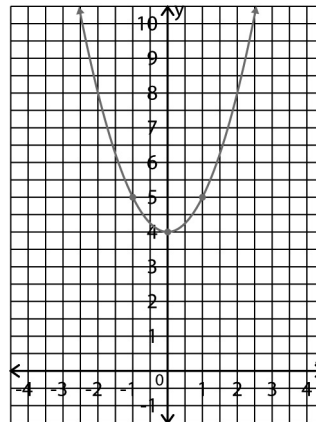
End behaviour: line extends from quadrant III to quadrant I

Domain: $\{x \mid x \in \mathbb{R}\}$

Range: $\{y \mid y \in \mathbb{R}\}$

Number of turning points: 0

b)



Number of x -intercepts: 0

y -intercept: 4

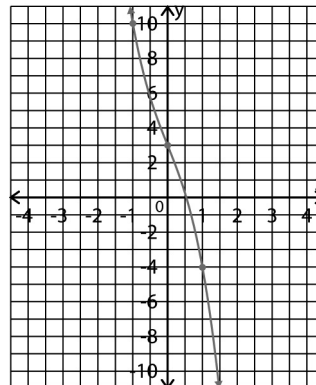
End behaviour: curve extends from quadrant II to quadrant I

Domain: $\{x \mid x \in \mathbb{R}\}$

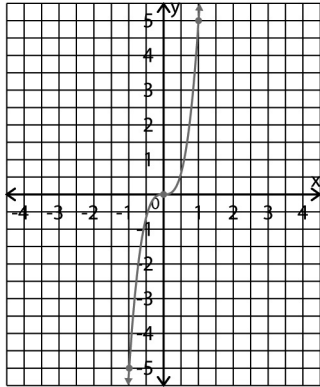
Range: $\{y \mid y \geq 4, y \in \mathbb{R}\}$

Number of turning points: 1

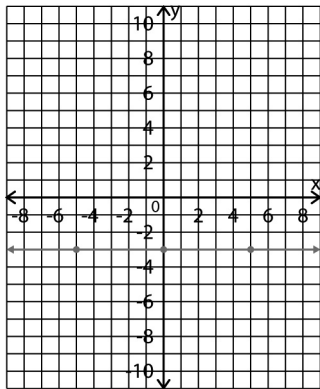
c)



Number of x -intercepts: 1
 y -intercept: 3
 End behaviour: curve extends from quadrant II to quadrant IV
 Domain: $\{x \mid x \in \mathbb{R}\}$
 Range: $\{y \mid y \in \mathbb{R}\}$
 Number of turning points: 0
d)

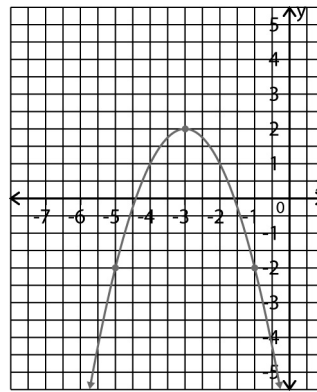


Number of x -intercepts: 1
 y -intercept: 0
 End behaviour: curve extends from quadrant III to quadrant I
 Domain: $\{x \mid x \in \mathbb{R}\}$
 Range: $\{y \mid y \in \mathbb{R}\}$
 Number of turning points: 0
e)



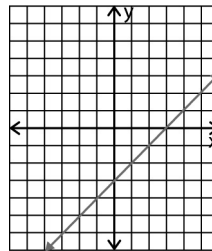
Number of x -intercepts: 0
 y -intercept: -3
 End behaviour: line extends from quadrant III to quadrant IV
 Domain: $\{x \mid x \in \mathbb{R}\}$
 Range: $\{y \mid y = -3\}$
 Number of turning points: 0

f)

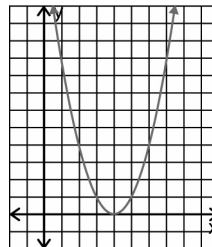
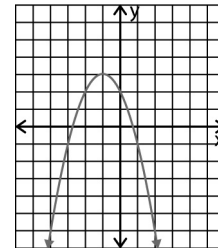
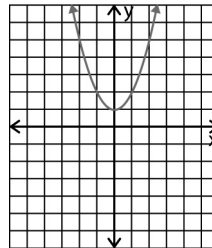


Number of x -intercepts: 2
 y -intercept: -7
 End behaviour: curve extends from quadrant III to quadrant IV
 Domain: $\{x \mid x \in \mathbb{R}\}$
 Range: $\{y \mid y \leq 2, y \in \mathbb{R}\}$
 Number of turning points: 1

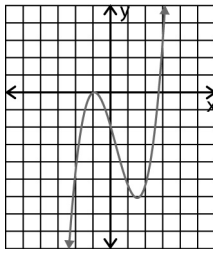
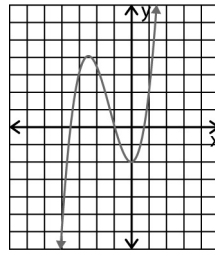
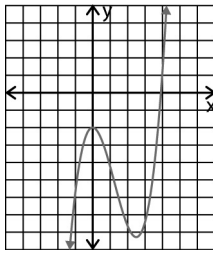
4. a)



b)



c)



Lesson 6.2: Characteristics of the Equations of Polynomial Functions, page 393

1. a) Degree: 2
Leading coefficient: 6
Constant term: -2
b) Degree: 1

Leading coefficient: $-\frac{2}{3}$

Constant term: 10
c) Degree: 3
Leading coefficient: -1
Constant term: 6

d) Degree: 3
Leading coefficient: 4
Constant term: -10

2. a) i) Minimum: 0
Maximum: 2
ii) End behaviour: graph extends from quadrant II to quadrant I

Domain: $\{x \mid x \in \mathbb{R}\}$
Range: $\{y \mid y \geq \text{minimum}, y \in \mathbb{R}\}$

iii) Minimum: 1
Maximum: 1

b) i) Minimum: 1
Maximum: 1
ii) End behaviour: graph extends from quadrant II to quadrant IV

Domain: $\{x \mid x \in \mathbb{R}\}$
Range: $\{y \mid y \in \mathbb{R}\}$

iii) Minimum: 0
Maximum: 0

c) i) Minimum: 1
Maximum: 3

ii) End behaviour: graph extends from quadrant II to quadrant IV

Domain: $\{x \mid x \in \mathbb{R}\}$

Range: $\{y \mid y \in \mathbb{R}\}$

iii) Minimum: 0

Maximum: 2

d) i) Minimum: 1

Maximum: 3

ii) End behaviour: graph extends from quadrant III to quadrant I

Domain: $\{x \mid x \in \mathbb{R}\}$

Range: $\{y \mid y \in \mathbb{R}\}$

iii) Minimum: 0

Maximum: 2

3. a) Degree: 2

Sign of leading coefficient: -

Constant term: 2

b) Degree: 1

Sign of leading coefficient: +

Constant term: 2

c) Degree: 3

Sign of leading coefficient: +

Constant term: -1

d) Degree: 3

Sign of leading coefficient: -

Constant term: 6

4. a) e.g., $y = 5$

b) e.g., $y = x + 5$

c) e.g., $y = x^2 + x + 5$

d) e.g., $y = x^3 + x^2 + x + 5$

5. a) The graph extends from quadrant III to quadrant I.

b) The graph extends from quadrant III to quadrant IV.

c) The graph extends from quadrant II to quadrant I.

d) The graph extends from quadrant II to quadrant IV.

e) The graph extends from quadrant II to quadrant IV.

f) The graph extends from quadrant III to quadrant I.

6. a) The correct function for this graph is v. Only v and vi are possible choices, because they are the only ones that are linear. The graph extends from quadrant II to quadrant IV, and the slope is -1. This means that the leading coefficient is -1. Therefore, v is the proper choice.

b) The correct function for this graph is i. Only i and iv are possible choices, because they are the only ones that are cubic. The graph extends from quadrant II to quadrant IV, which means that the leading coefficient is negative. Therefore, i is the proper choice.

c) The correct function for this graph is ii. Only ii and iii are possible choices, because they are the only ones that are quadratic. The graph has a y-intercept of 4, which means that the constant term is 4. Therefore, ii is the proper choice.