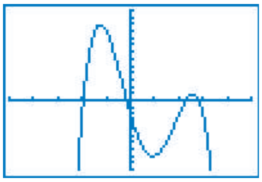
Lesson 1.3 Math Lab: Assess Your Understanding, pages 34–36

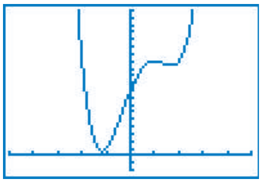
1. a) Use graphing technology. Graph each polynomial function of degree 4, then sketch its graph.

i) $f(x) = -x^4 + 3x^3 + 4x^2 - 12x - 2$

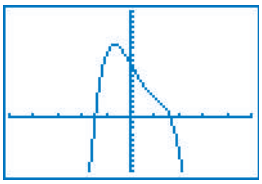


A polynomial function of degree 4 is a **quartic function**.

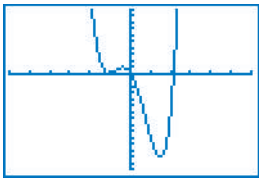
ii) $g(x) = x^4 - 2x^3 - 3x^2 + 8x + 9$



iii) $h(x) = -2x^4 + 4x^3 - 8x + 10$



iv) $j(x) = 2x^4 - 7x^2 - 5x$



b) How does the sign of the x^4-term affect the shape of the graph?

When the x^4-term is positive, the graph opens up. When the x^4-term is negative, the graph opens down.

c) How does the value of the constant term affect the graph of the function?

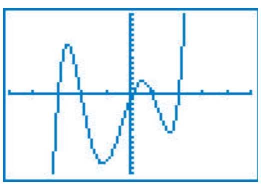
The value of the constant term is the *y*-intercept of the graph of the function.

d) How are the graphs of quartic functions like the graphs of quadratic functions? How are they different?

When the term with greatest degree in the equation is positive, the graph opens up. When the term with greatest degree is negative, the graph opens down. The value of the constant term in the equation of a quadratic or quartic function is the *y*-intercept of its graph. The graph of a quadratic or quartic function has at least one hill or valley. The graph of a quadratic function has either 1 hill or 1 valley, but the graph of a quartic function can have 2 hills and 1 valley, or 2 valleys and 1 hill, or just 1 hill or valley.

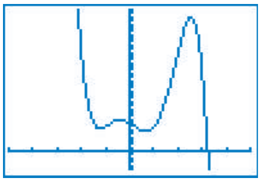
2. a) Use graphing technology. Graph each polynomial function of degree 5, then sketch its graph.

i) $f(x) = x^5 + 2x^4 - 7x^3 - 8x^2 + 12x - 1$

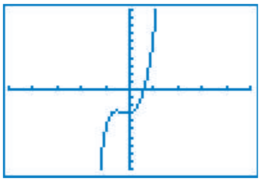


A polynomial function of degree 5 is a **quintic function**.

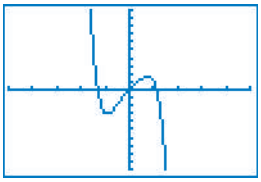
ii) $g(x) = -x^5 + 2x^4 + 5x^3 - 3x^2 - 4x + 8$



iii) $h(x) = 2x^5 - x^4 + 3x^3 + 5x^2 + x - 3$



iv) $j(x) = -2x^5 + x^3 - x^2 + 3x$



b) How does the sign of the x^5-term affect the shape of the graph?

When the x^5-term is positive, the graph falls to the left and rises to the right. When the x^5-term is negative, the graph rises to the left and falls to the right.

c) How does the value of the constant term affect the graph of the function?

The value of the constant term is the y-intercept of the graph of the function.

d) How are the graphs of quintic functions like the graphs of cubic functions? How are they different?

When the term with the greatest degree in the equation is positive, the graph falls to the left and rises to the right. When the term with the greatest degree is negative, the graph rises to the left and falls to the right. The value of the constant term in the equation of a cubic or quintic function is the y-intercept of its graph. The graph of a cubic or quintic function has equal numbers of hills and valleys. The graph of a cubic function can have at most 1 hill and 1 valley, but the graph of a quintic function can have up to 2 hills and 2 valleys.