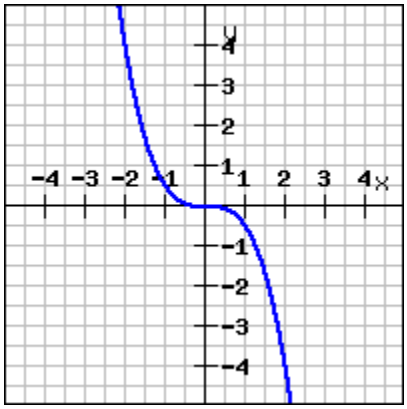
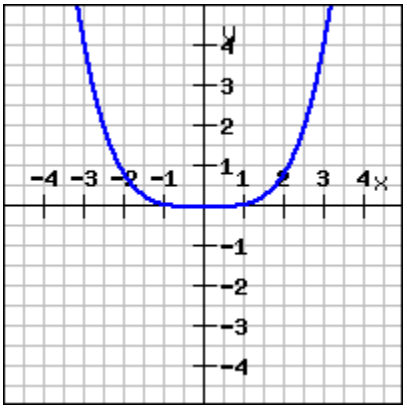
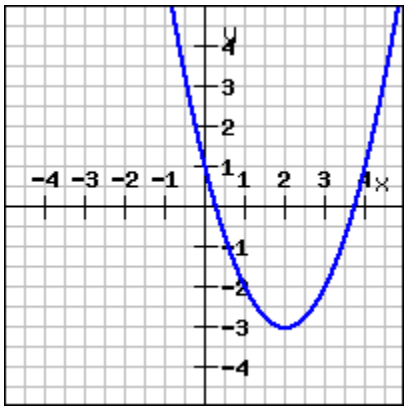
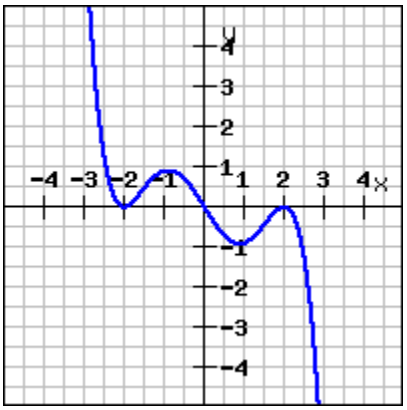
MHF4U: Polynomial/Power Functions

1. State whether each function is a polynomial function or not.
   a. $f(x) = 4x^2 - 3x + 1$
   b. $g(x) = 2^x - 5$
   c. $d(t) = -0.5d^3 + 9.3d^2 - 8d + 3$
   d. $h(k) = 2x^3 + x^2 - \frac{1}{x}$
2. State whether each polynomial function is a power function or not.
   a. $f(x) = 3x^4$
   b. $m(n) = -12.5n^2$
   c. $j(k) = 7k^2 + 3$
   d. $g(x) = 5x^2 + x$
3. State whether each graph represents a power function or not. Justify your answer.

a. 

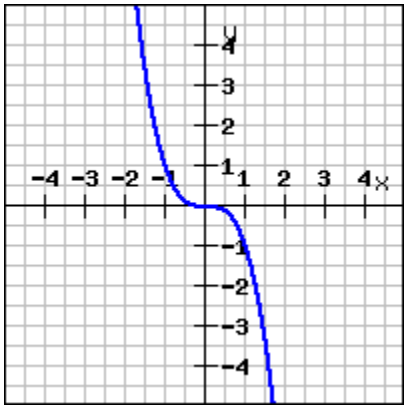
b. 

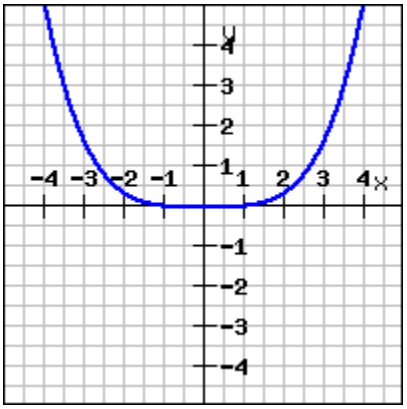
c. 

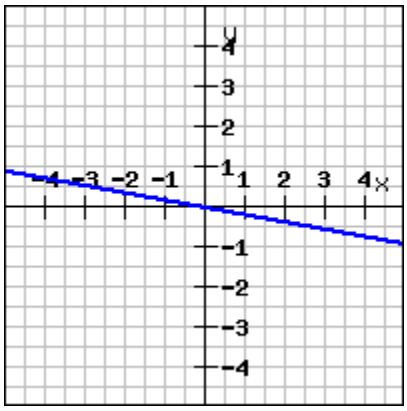
d. 

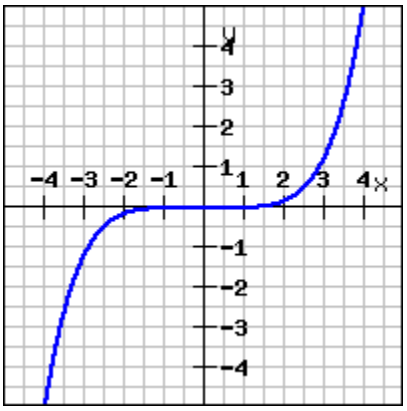
4. Describe how you might identify the difference between a cubic power function and a quintic power function.
5. Classify each function as linear, quadratic, cubic, quartic, quintic or neither.
   a. $f(x) = -5x^2 - 4x + 1$
   b. $g(x) = 12x^4 + 3x - 8$
   c. $h(x) = 6.2x^3 + 9.1x^2 - 2.8x + 2.3$

6. State the degree, and the value of the leading coefficient, for each polynomial function.
   a. $f(x) = 5x^3 - 4x^2 + 8$
   b. $p(v) = -17v^4 + 8v^2 + 12v - 3$
   c. $c(w) = \frac{3}{5}w^5 + w^2$
7. State a possible degree, and the sign of the leading coefficient, for each power function.

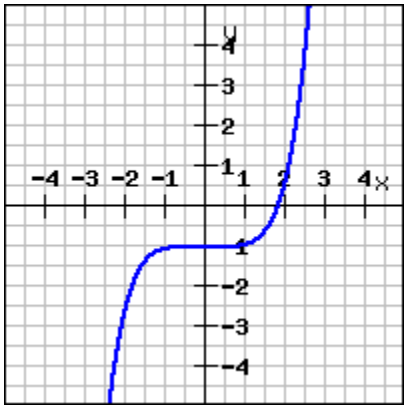
a. 

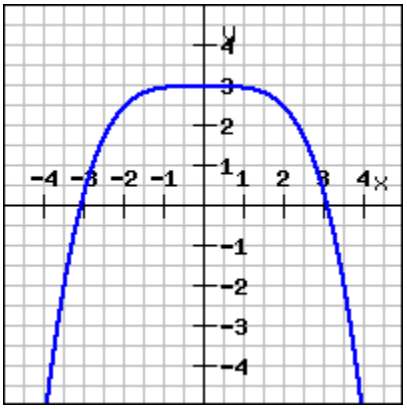
b. 

c. 

d. 

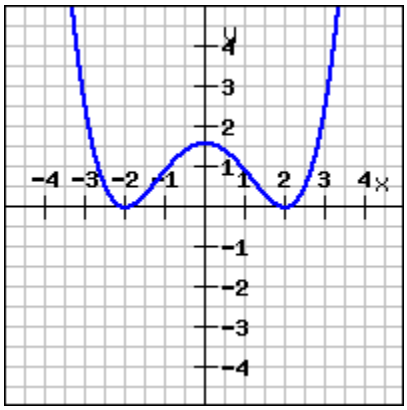
8. Describe the end behaviour for each polynomial function.

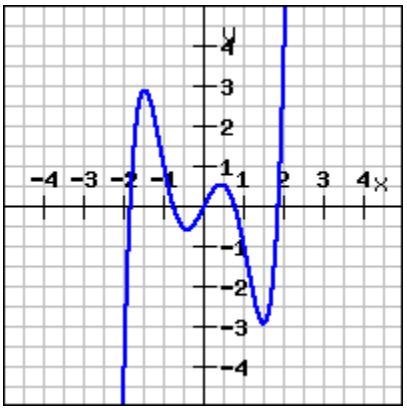
a. 

b. 

9. Describe the end behaviour for each polynomial function.
   a. $f(x) = 2x^2 - 4x - 3$
   b. $g(x) = -4x^3 + 2x + 9$
   c. $h(x) = -7x^4 - 8x^3 + 2x - 11$

10. For each graph, state:
    - whether it is odd, even or neither
    - the sign of the leading coefficient
    - the end behaviour
    - the domain and range

a. 

b. 

11. What can be said about the values of a, b and c in $f(x) = ax^2 + bx + c$ if it is an even function?
12. As its side length increases, the surface area of a cube also increases.
    a. State an equation for the surface area of a cube, where the side length is 10 cm or less.
    b. What type of polynomial function is this?
    c. State the domain and range.

Solutions

1. a. yes b. no c. yes d. no
2. a. yes b. yes c. no d. no
3. a. yes b. yes c. no d. no
4. Answers may vary
5. a. quadratic b. quartic c. cubic
6. a. 3; 5 b. 4; -17 c. 5; $\frac{3}{5}$
7. a. 3; neg b. 4; pos c. 1; neg d. 5; pos
8. a. as $x \to -\infty$, $f(x) \to -\infty$ and as $x \to \infty$, $f(x) \to \infty$
   b. as $x \to -\infty$, $f(x) \to -\infty$ and as $x \to \infty$, $f(x) \to -\infty$
9. a. as $x \to -\infty$, $f(x) \to \infty$ and as $x \to \infty$, $f(x) \to \infty$
   b. as $x \to -\infty$, $g(x) \to \infty$ and as $x \to \infty$, $g(x) \to -\infty$
   c. as $x \to -\infty$, $h(x) \to -\infty$ and as $x \to \infty$, $h(x) \to -\infty$
10. a. even; pos; as $x \to -\infty$, $f(x) \to \infty$ and as $x \to \infty$, $f(x) \to \infty$; D: $(-\infty, \infty)$; R: $[0, \infty)$
    b. odd; pos; as $x \to -\infty$, $f(x) \to -\infty$ and as $x \to \infty$, $f(x) \to \infty$; D: $(-\infty, \infty)$; R: $(-\infty, \infty)$
11. $a \in \Re$; $b = 0$; $c \in \Re$
12. a. $A(s) = 6s^2$ b. quadratic c. D: $[0, 10]$; R: $[0, 600]$