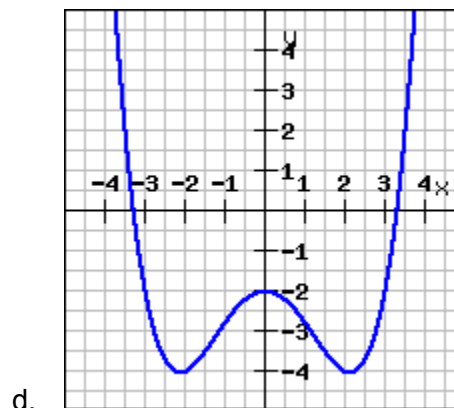
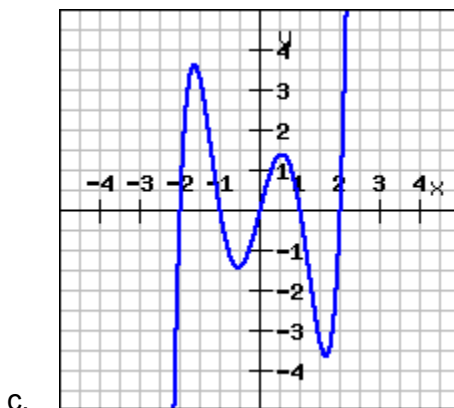
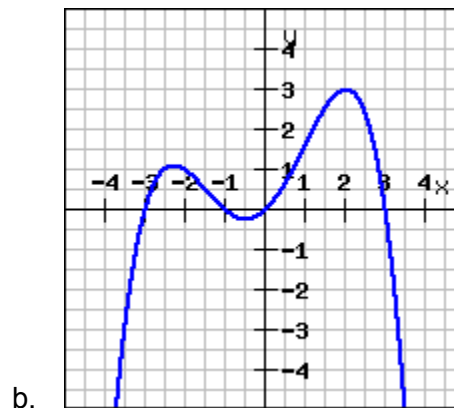
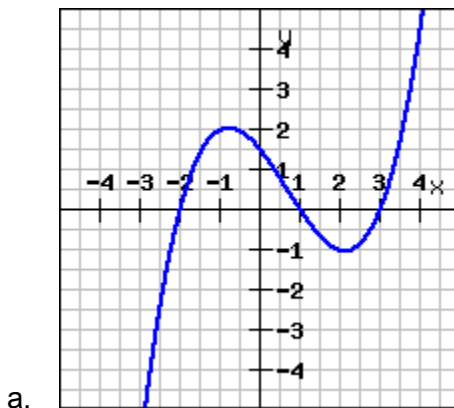


MHF4U: Characteristics of Polynomial Functions

1. A polynomial function extends from quadrant 2 to quadrant 4. Does the polynomial function have an odd or even degree, and what is the sign of the leading coefficient?
2. For each graph, state:
 - whether the polynomial function has even or odd degree
 - the minimum degree of the polynomial function
 - if the polynomial function is even, odd or neither
 - the sign of the leading coefficient
 - the end behaviour
 - the number of local minimums and local maximums



3. For each polynomial function, state:
 - the end behaviour
 - which finite differences are constant
 - the value of the constant finite differences
 - a. $f(x) = 2x^4 - 2x + 11$
 - b. $g(x) = -5x^3 + 6x^2 - 9x + 4$
 - c. $h(x) = \frac{1}{2}x^5 - 4x^3 + \frac{3}{4}x^2$
4. What type of polynomial function has constant fourth differences?

5. What is the value of the leading coefficient for a cubic function with constant finite differences of 54?
6. Each table describes a polynomial function. Determine the value of the leading coefficient.

a.

| x | $f(x)$ |
|-----|--------|
| 0 | 2 |
| 1 | 4 |
| 2 | 18 |
| 3 | 56 |
| 4 | 130 |
| 5 | 252 |

b.

| x | $f(x)$ |
|-----|--------|
| -1 | 3 |
| 0 | 0 |
| 1 | 2 |
| 2 | 0 |
| 3 | -27 |
| 4 | -112 |

7. What would be the equation of a quintic power function whose constant finite differences have a value of -360?
8. A polynomial function has a restricted range. What does this tell you about the degree of the function, and about the number of local extrema?
9. How many local extrema can a quartic equation have? Sketch a graph for each case.
10. How many x -intercepts can a quartic equation have? Sketch a graph for each case.
11. Sketch a polynomial function that has 3 local extrema and a negative leading coefficient.
12. A polynomial function is even. What does that tell you about the number of x -intercepts?

Solutions

1. odd; neg
2. a. odd; 3; neither; pos; as $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$ and as $x \rightarrow \infty$, $f(x) \rightarrow \infty$; 1 min, 1 max
b. even; 4; neither; neg; as $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$ and as $x \rightarrow \infty$, $f(x) \rightarrow -\infty$; 1 min, 2 max
c. odd; 5; odd; pos; as $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$ and as $x \rightarrow \infty$, $f(x) \rightarrow \infty$; 2 min, 2 max
d. even; 4; even; pos; as $x \rightarrow -\infty$, $f(x) \rightarrow \infty$ and as $x \rightarrow \infty$, $f(x) \rightarrow \infty$; 2 min, 1 max
3. a. as $x \rightarrow -\infty$, $f(x) \rightarrow \infty$ and as $x \rightarrow \infty$, $f(x) \rightarrow \infty$; 4th; 48
b. as $x \rightarrow -\infty$, $f(x) \rightarrow \infty$ and as $x \rightarrow \infty$, $f(x) \rightarrow -\infty$; 3rd; -30
c. as $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$ and as $x \rightarrow \infty$, $f(x) \rightarrow \infty$; 5th; 60
4. quartic
5. 9
6. a. 2 b. $-\frac{1}{2}$
7. -3
8. answers may vary
9. 1-3; graphs may vary
10. 0-4; graphs may vary
11. graphs may vary
12. answers may vary