

SECTION 6-1

POLYNOMIAL FUNCTIONS

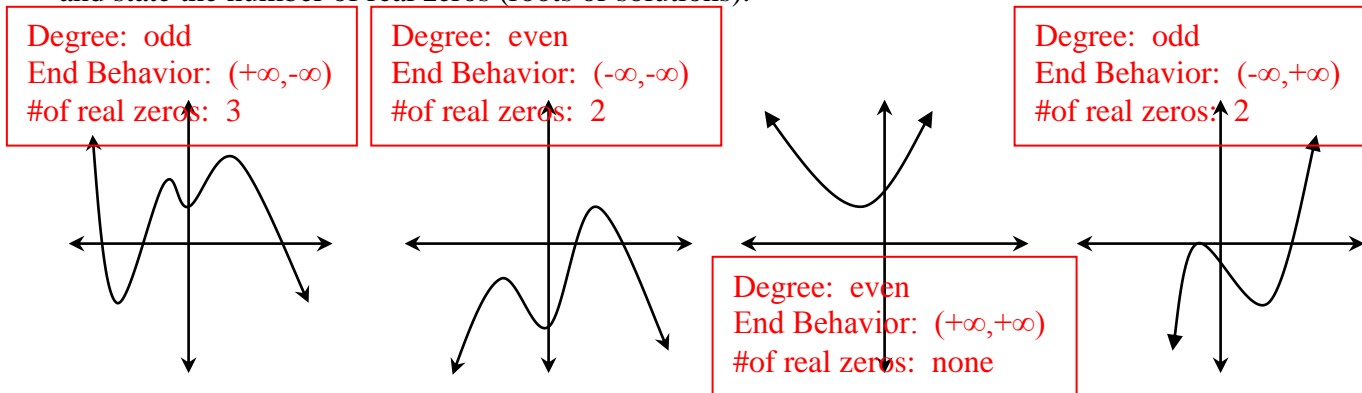
A polynomial of degree n in one variable x is an expression of the form $a_nx^n + a_{n-1}x^{n-1} + \dots + a_2x^2 + a_1x + a_0$, where the coefficients $a_n, a_{n-1}, \dots, a_2, a_1, a_0$ represent real numbers, a_n is not zero and n represents a nonnegative integer.

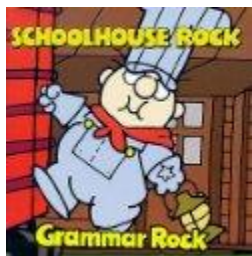
Examples:

| | Is (or isn't) a polynomial in one variable | Degree | Leading Coefficient |
|----------------------------------|---|--------|---------------------|
| 1) $10x^4 - 3x^3 + 7x - 3$ | Is | 4 | 10 |
| 2) $-5y^{10} + 8y - 2y^{11} + 1$ | Is | 11 | -2 |
| 3) $a^7 - 6ab - 2a^3b^5$ | Isn't | _____ | |
| 4) $8 + b^3 + b^2 + b + b^{-1}$ | Isn't | _____ | |
| 5) $\frac{n^3}{2} + \frac{n}{5}$ | Is | 3 | 1/2 |
| 6) $\frac{n^3}{2} + \frac{5}{n}$ | Isn't | _____ | |
| 7) $6r^2 - 5r^3 - r^4$ | Is | 4 | -1 |
| 8) $9x + (6 - 2i)x^2$ | Isn't | _____ | |

Information for polynomial functions in one-variable drawn from their graphs....

For each graph, determine whether it has an even or odd-degree, describe the graph's end behavior, and state the number of real zeros (roots or solutions).





Conjunction junction, what's my function.....

Given the function: $f(x) = x^3 - 2x + 9$, find

1) $f(-2)$

2) $f(3)$

3) $f(4a)$

$$\begin{aligned} f(-2) &= (-2)^3 - 2(-2) + 9 \\ &= -8 + 4 + 9 \\ &= -4 + 9 \\ &= 5 \end{aligned}$$

$$\begin{aligned} f(3) &= (3)^3 - 2(3) + 9 \\ &= 27 - 6 + 9 \\ &= 21 + 9 \\ &= 30 \end{aligned}$$

$$\begin{aligned} f(4a) &= (4a)^3 - 2(4a) + 9 \\ &= 64a^3 - 8a + 9 \\ &\text{done! not like} \\ &\text{terms can't combine} \end{aligned}$$

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Use these three functions: $f(x) = 3x - 11$ and $g(x) = 2x^2 - 1$ and $h(x) = x^3$

1) $4f(x)$

$$\begin{aligned} 4f(x) &= 4[f(x)] \\ &= 4[3x - 11] \\ &= 12x - 44 \end{aligned}$$

2) $g(y + 1)$

FOIL

$$\begin{aligned} g(y + 1) &= 2(y+1)^2 - 1 \\ &= 2(y + 1)(y + 1) - 1 \\ &= 2(y^2 + 2y + 1) - 1 \\ &= 2y^2 + 4y + 2 - 1 \\ &= 2y^2 + 4y + 1 \end{aligned}$$

3) $-2[h(5a^4)]$

$$\begin{aligned} -2[h(5a^4)] &= -2[(5a^4)^3] \\ &= -2[125a^{12}] \\ &= -250a^{12} \end{aligned}$$

COLLEGE PREP:

4) $2[h(n - 2)] + f(5n)$

| | | | |
|--------------|-------------------------------------|---|--------------|
| Treat like | $2[(n - 2)^3]$ | + | $3(5n) - 11$ |
| two | $= 2[(n - 2)(n - 2)(n - 2)]$ | + | $15n - 11$ |
| separate | $= 2[(n^2 - 4n + 4)(n - 2)]$ | | |
| problems | $= 2[\text{box! shown to right}]$ | | |
| | $= 2[n^3 - 6n^2 + 12n - 8]$ | | |
| Combine @end | $2n^3 - 12n^2 + 24n - 16$ | + | $15n - 11$ |
| | $= 2n^3 - 12n^2 + 39n - 27$ | | |

| | | | |
|------|---------|---------|------|
| | n^2 | $-4n$ | 4 |
| n | n^3 | $-4n^2$ | $4n$ |
| -2 | $-2n^2$ | $8n$ | -8 |