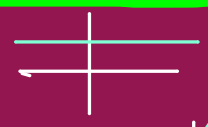
December 10, 2024

Polynomial Graphs

- "many terms"
- one or more terms
- Whole # exponents

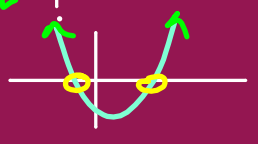
Degree = highest power

$f(x) = 2x^0$



$f(x) = 2x+3$
Linear

$f(x) = 3x^2-4x+7$
Quadratic

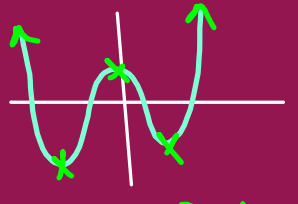


max # of x-intercepts = Degree
(roots, solutions)

$f(x) = x^3-3x^2+x+1$
Cubic

Max # of peaks/valleys = Degree - 1

$f(x) = x^4-4x^3-9x^2+16x+20$
Quartic



End Behavior

Even degree = ends go in same direction

Odd degree = ends go in opposite directions

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Name_____

POLYNOMIALS HANDOUT

For each function, determine if it is a polynomial and then state the degree, the name, and the leading coefficient.

1. $f(x) = -3x + 5x^3 - 6x + 2$ Cubic lead. coeff = 5 Deg = 3

2. $f(x) = 9x^4 + 8x^3 - 6x^{-2} - 1$

3. $f(x) = 3x^4 + 2x - \frac{5}{x} + 9x^2 - 7$ Not a polyn.

4. $f(x) = \frac{5}{3}x^2 - \sqrt{7}x^4 + 8x^3 - \frac{1}{2} + x$

Match each function and graph.

E 5. $f(x) = -3x^2 + 8x - 1$

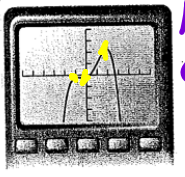
A 6. $f(x) = -x^4 + x^3 + 4x^2 + 2x - 1$

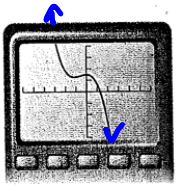
B 7. $f(x) = -2x^3 - 3x^2 + 7$ ends opposite

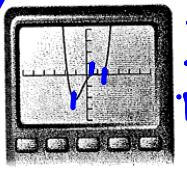
F 8. $f(x) = 4x - 5$

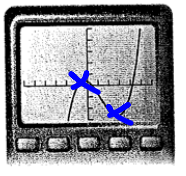
C 9. $f(x) = 2x^4 - 2x^3 - 5x^2 + 7x - 2$

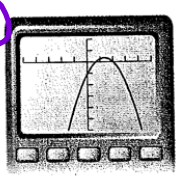
D 10. $f(x) = x^3 - 4x^2 - 3x + 2$

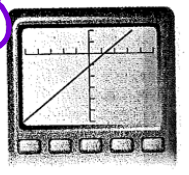
A.  lead = − even deg. 4th deg or higher

B. 

 even + l.c. Deg = 4+

D. 

E. 

F. 

11. $f(x) = 9x^3 - 4 + x^2$

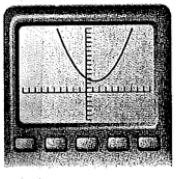
12. $f(x) = 0.4x^2 - x + 3$

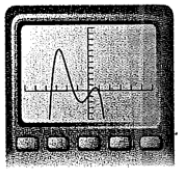
13. $f(x) = x^4 - 4x^3 + x^2 - 6$

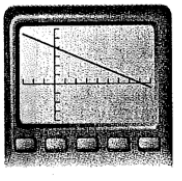
14. $f(x) = -3x^3 - 8x^2 - x + 1$

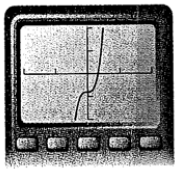
15. $f(x) = 8 - x$

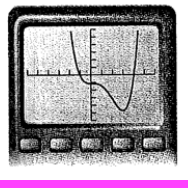
16. $f(x) = -x^4 - 4x^3 + x^2 + 6x - 2$

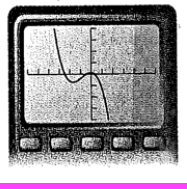
A. 

B. 

C. 

D. 

E. 

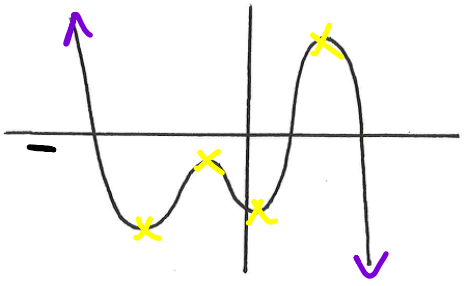
F. 

Describe the degree and sign of the leading coefficient of the polynomial function using the graph.

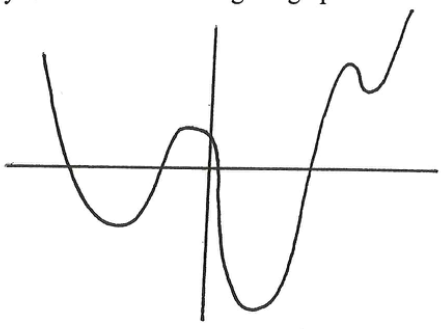
17.

odd

$-x^5$



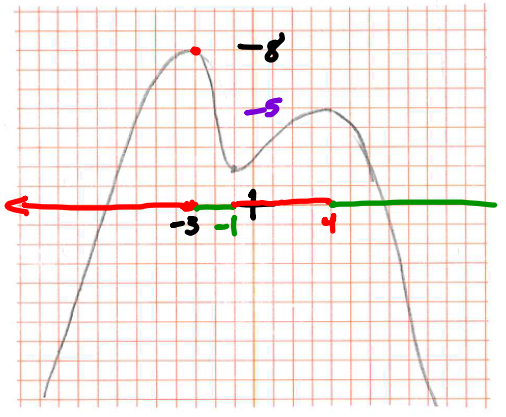
18.



↙ x-cord to x-coord

For each function, identify (a) intervals where the function is increasing or decreasing, (b) coordinates of all relative maximums and minimums, and (c) coordinates of all absolute maximums and minimums.

19.



increasing = moves upward L to R

decreasing = moves downward L to R

Inc: $(-\infty,-3)$ $(-1,4)$

Dec: $(-3,-1)$ $(4,\infty)$

20.

Relative max/min (extrema)

- any peak or valley

Coordinates: Rel. max = (-3,8) (4,5)

Rel min: (-1,2)

Absolute extrema

- highest & lowest pts on the graph

Abs max: (-3,8)

Abs min: None

Find the real zeros of each polynomial using your calculator. Round to hundredths.

21. $f(x)=x^4+2x^3-x-1$

22. $f(x)=-x^5+9x^3-9x$

Graph on calculator

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Polynomial Operations

$(4x^3+2x^7+3x-9)+(-x^6+7x^7+4x^3+8)$

$= -5x^7 - x^6 + 8x^3 + 3x - 17$

$(2x+3)(4x-1)(x+5)$

FOIL

$(8x^2-2x+12x-3)(x+5)$

$(8x^2+10x-3)(x+5)$

$8x^3+10x^2-3x+40x^2+50x-15$

$= \boxed{8x^3+50x^2+47x-15}$

Special Cases

$(4x+3)(4x-3)$ Conjugates

FL

$= 16x^2 - 9$

$(3x-7)^2 = (3x-7)(3x-7)$

$= 9x^2 - 21x - 21x + 49$

$= 9x^2 - 42x + 49$