

POLYNOMIAL GRAPHS

$$f(x) = 2$$

constant



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

linear



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

quadratic



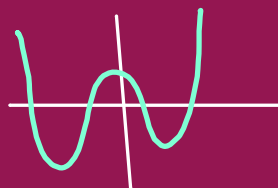
$$f(x) = x^3 - 3x^2 + x + 1$$

cubic



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

quartic



Poly = many terms
 = 1 or more terms
 = whole # exponents
 no fractions, no vars
 in denom.

Degree = highest power

of x-int (zeros) $\leq$ degree

of peak/valleys $\leq$ degree - 1

End Behavior

Odd degree - ends go in opposite directions
 Even degree - " " " " same direction

Name _____

POLYNOMIALS HANDOUT

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

1. $f(x) = -3x + 5x^3 - 6x^2 + 2$

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

3. $f(x) = 3x^4 = 2x - \frac{5}{x} + 9x^2 - 7$

Not

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

F

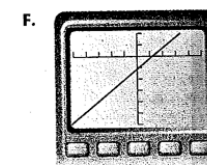
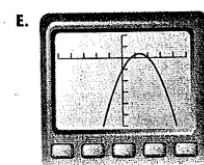
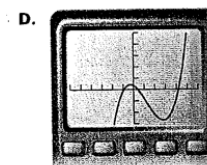
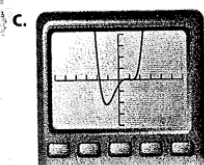
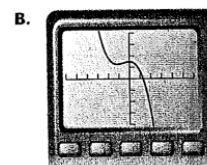
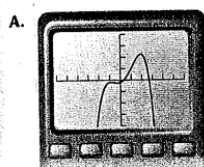
8. $f(x) = 4x - 5$

C

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

D

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



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

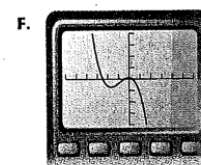
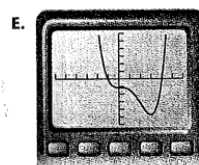
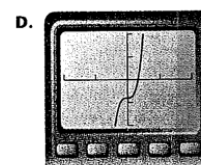
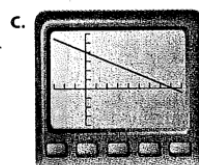
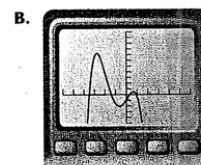
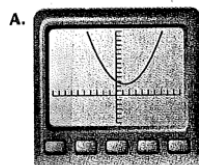
12. $f(x) = 0.4x^2 - x + 3$

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

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

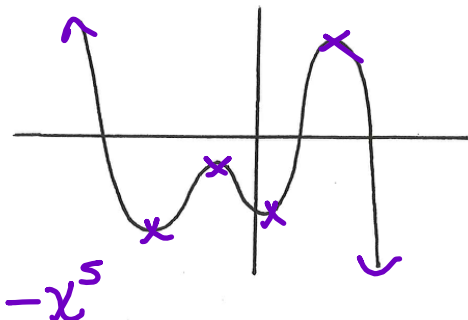
15. $f(x) = 8 - x$

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

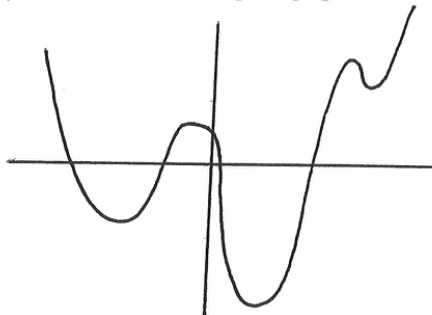


Describe the degree and sign of the leading coefficient of the polynomial function using the graph.

17.

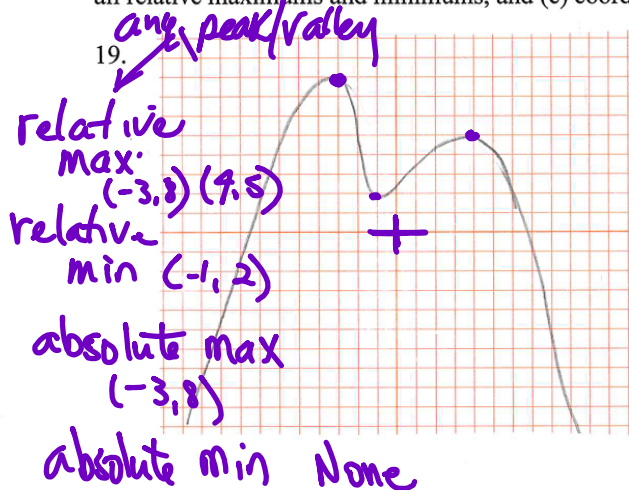


18.

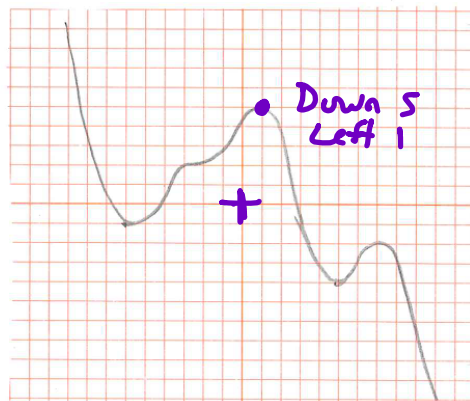


For each function, identify (a) ~~intervals where the function is increasing or decreasing~~, (b) coordinates of all relative maximums and minimums, and (c) coordinates of all absolute maximums and minimums.

19.



20.



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

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

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

Could be 4.

POLYNOMIAL OPERATIONS

$$(\underline{4x^3} + \underline{2x^7} + \underline{3x} - \underline{9}) + (\underline{-x^6} + \underline{7x^7} + \underline{4x^3} + \underline{8})$$

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

$$(\underline{2x+3})(\underline{4x-1})(x+5)$$

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

$$(\underline{8x^2} + \underline{10x} - \underline{3})(\underline{x+5})$$

$$\underline{8x^3} + \underline{10x^2} - \underline{3x} + \underline{40x^2} + \underline{50x} - \underline{15}$$

$$= 8x^3 + 50x^2 + 47x - 15$$

Special Cases

$$(\underline{4x+3})(\underline{4x-3}) \quad \text{conjugates}$$

$$= 16x^2 - 9 \quad \text{FL}$$

$$\overset{2 \cdot 3 \cdot -7}{(\underline{3x-7})^2} = (\underline{3x-7})(\underline{3x-7})$$

$$\begin{matrix} \uparrow & \uparrow \\ 50 & 50 \end{matrix} = 9x^2 - 21x - 21x + 49$$

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

FACTORING

★ First Step = Pull out
common factors

$$4x^2 - 10x + 50$$

$$2(2x^2 - 5x + 25)$$

2 terms conjugates

$$a^2 - b^2 = (a+b)(a-b)$$

$$a^2 + b^2 = \text{not factorable}$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

Factor.

$$8/x^2 - 49$$

$$(1x+7)(1x-7)$$

$$x^2 + 4$$

$$(x+2)(x-3)$$

$$x^3 - 64 \quad 4^3 = 64$$

$$= (x-4)(x^2 + 4x + 16)$$

$$2x^3 + 54$$

$$2(x^3 + 27)$$

$$2(x+3)(x^2 - 3x + 9)$$

3 terms — UNFOIL

$$x^2 + 2x - 15$$
$$(x+5)(x-3)$$

4 terms — Grouping

$$(3x^3 + 15x^2)(-2x - 10)$$

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

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