POLYNOMIAL GRAPHS
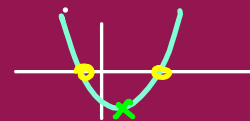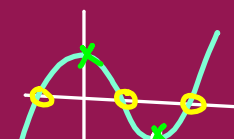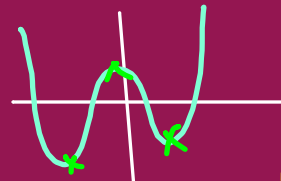
$f(x) = 2x^0$

$f(x) = 2x + 3$

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

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

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

Leading coeff =
if negative, ends
switch direction

— Polynomial —

- many terms
- variables have
   whole # exponents

Degree of polyn =
   highest power

X-intercepts =
   degree or less

peaks/valleys =
   Degree - 1

End behavior

Odd degree — ends
   in
   opposite
   directions

Even degree = ends
   in 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.

leading

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

3rd degree,

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

not

No 2. $f(x) = 9x^4 + 8x^3 + 6x^{-2} - 1$

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

Match each function and graph.
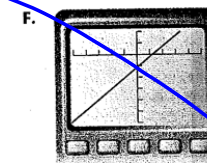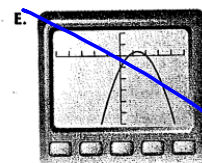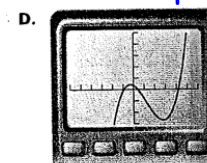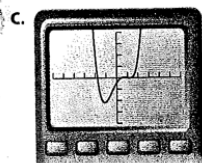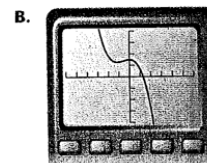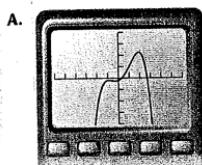
E 5. $f(x) = -3x^2 + 8x - 1$

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

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

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.

B.

C.

D.

E.

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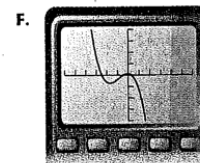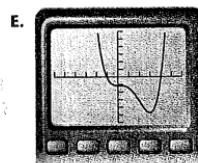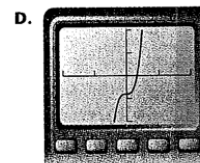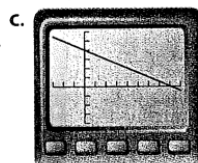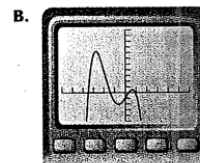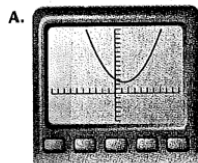
11. $f(x) = 9x^3 - 4 + x^2$

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

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

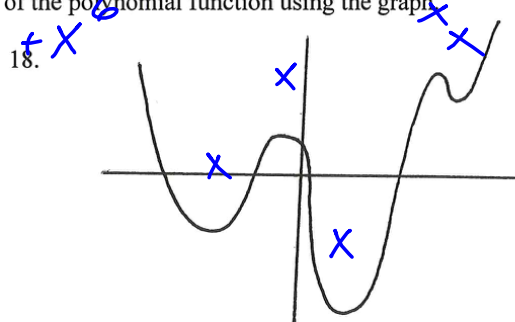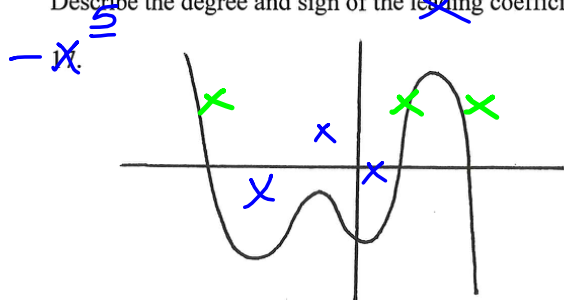14. $f(x) = -3x^3 - 8x^2 - x + 1$

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.

$-x^5$

18. $+x^6$

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.

any peak value

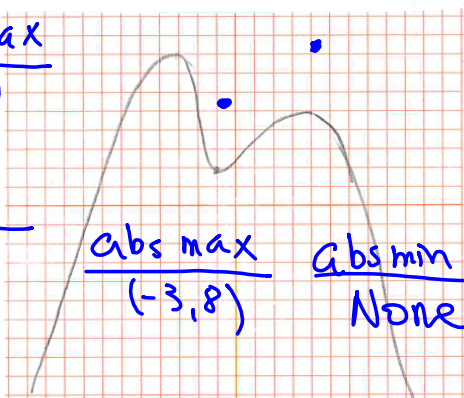The lowest point/highest pt on graph
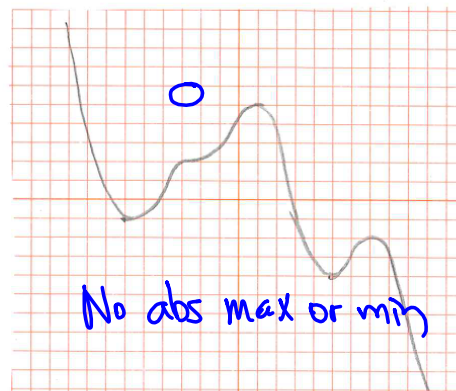
rel max
(-3, 8)
(4, 5)
rel min
(-1, 2)

19.

abs max
(-3, 8)

abs min
None

20.

No abs max or min

Find the real zeros of each polynomial using your calculator. Round to hundredths.
21. $f(x) = x^4 + 2x^3 - x - 1$

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

POLYNOMIAL OPERATIONS

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

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

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

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

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

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

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

Special Cases

$$(4x+3)(4x-3) \leftarrow \text{conjugates}$$
$$- \text{FL}$$
$$=16x^2-9$$

$2 \cdot 3x \cdot -7$

FOIL

$$(3x-7)^2=(3x-7)(3x-7)$$
$$=9x^2-21x-21x+49$$
$$=9x^2-42x+49$$

FACTORING

⭐ <u>First Step</u> = pull out common factors

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

<u>2 terms</u>

conjugates ↓

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

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

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

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

$$25x^2 - 81$$
$$(5x+9)(5x-9)$$

$$25x^2 + 81$$
$$(5x+9)(5x+9)$$

$$2x^3 + 16$$
$$2(x^3 + 8)$$
$$2(x+2)(x^2 - 2x + 4)$$

$$p^3 - 64 \quad \downarrow 4^3$$
$$= (p-4)(p^2 + 4p + 16)$$

$\underline{3 \text{ terms}}$ — UnFOIL

$x^2 + 2x - 15$

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

$\underline{4 \text{ terms}}$ — Grouping — $\underline{2 \text{ steps!}}$

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

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

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

1) Pull common factors out of each group

← must get same quantity

2) Pull common quantity out

DIVISION $\dfrac{x^5 - 2x^2 - 27}{x - 2}$

Long Division

Synthetic Division