

Day 2 Group HW Key

Join my G.Classrm: [uj27d9](#)

2.  $(x - 3)(x + 2)(x - 2)(x + 1)$

Do the warmup problem.

4.  $(x + 3)(x - 3)(x^2 + x + 2)$

6.  $(x^2 + 2)(x^2 + 4)(x + 2)(x - 2)$

8. 7

10.  $h = -2, k = 5$

11.  $h = 4, k = -2$

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Factor each of the following completely.

Hint: you may need to use substitution to make the question look more familiar.

Finish for HW any problems you did not complete in class.

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

Let  $u = (x^2 + 3x)$

$u^2 - 2u - 8$

$(u - 4)(u + 2)$

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

$= (x + 4)(x - 1)(x + 2)(x + 1)$

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

Let  $u = (x^2 - x)$

$u^2 - 8u + 12$

$(u - 6)(u - 2)$

$(x^2 - x - 6)(x^2 - x - 2)$

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

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$$\begin{aligned}
 3. \quad & \underbrace{x^4 - 3x^2 - 10}_{(x^2-5)(x^2+2)} + \underbrace{4x^3 + 8x}_{4x(x^2+2)} \\
 & (x^2-5)(x^2+2) + 4x(x^2+2) \\
 & (x^2+2)(x^2+4x-5) \\
 & = (x^2+2)(x+5)(x-1)
 \end{aligned}$$

$$\begin{aligned}
 4. \quad & \underbrace{x^4 - 7x^2 - 18}_{(x^2-9)(x^2+2)} + \underbrace{x^3 - 9x}_{x(x^2-9)} \\
 & (x^2-9)(x^2+2) + x(x^2-9) \\
 & = (x^2-9)(x^2+x+2) \\
 & = (x+3)(x-3)(x^2+x+2)
 \end{aligned}$$

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$$\begin{aligned}
 5. \quad & x^4 + 2x^3 - 8x - 16 \\
 & = x^3(x+2) - 8(x+2) \\
 & = (x+2)(x^3-8) \\
 & = (x+2)(x-2)(x^2+2x+4)
 \end{aligned}$$

Aside:

$$\begin{aligned}
 x^3 - 8 &= (x-2)(x^2+2x+4) \\
 a &= x \\
 b &= 2
 \end{aligned}$$

$$\begin{aligned}
 6. \quad & x^6 + 2x^4 - 16x^2 - 32 \\
 & = x^4(x^2+2) - 16(x^2+2) \\
 & = (x^2+2)(x^4-16) \\
 & = (x^2+2)(x^2+4)(x^2-4) \\
 & = (x^2+2)(x^2+4)(x+2)(x-2)
 \end{aligned}$$

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8. If  $(2x^2 + bx - 10)(x + 5) = 2x^3 + 17x^2 + 25x - 50$  is true for all values of  $x$ , what is  $b$ ?

$$x(2x^2 + bx - 10) + 5(2x^2 + bx - 10) = 2x^3 + 17x^2 + 25x - 50$$

$$\begin{array}{r} 2x^3 + bx^2 - 10x + 10x^2 + 5bx - 50 = 2x^3 + 17x^2 + 25x - 50 \\ -2x^3 \quad \quad \quad +50 \quad -2x^3 \quad \quad \quad +50 \end{array}$$

$$\begin{array}{r} bx^2 - 10x^2 - 10x + 5bx = 17x^2 + 25x \\ -10x^2 \quad +10x \quad \quad \quad -10x^2 + 10x \end{array}$$

$$\underline{bx^2 + 5bx} = \underline{7x^2 + 35x}$$

$$\begin{array}{l|l} bx^2 = 7x^2 & 5bx = 35x \\ b = 7 & b = 7 \end{array}$$

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9. If  $(2x + 3)(4x^2 - 5x + 6) = ax^3 + bx^2 + cx + d$ , what is the value of  $2b + c$ ?

$$2x(4x^2 - 5x + 6) + 3(4x^2 - 5x + 6)$$

$$8x^3 - 10x^2 + 12x + 12x^2 - 15x + 18$$

$$8x^3 + 2x^2 - 3x + 18$$

$$a = 8$$

$$c = -3$$

$$b = 2$$

$$d = 18$$

$$\begin{aligned} 2b + c &= 2(2) + (-3) \\ &= 1 \end{aligned}$$

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10. From Alg2CC Regents January 2017

Algebraically determine the values of h and k to correctly complete the identity stated below:

$$2x^3 - 10x^2 + 11x - 7 = (x - 4)(2x^2 + hx + 3) + k$$

$$2x^3 - 10x^2 + 11x - 7 = x(2x^2 + hx + 3) - 4(2x^2 + hx + 3) + k$$

$$\begin{array}{r} 2x^3 - 10x^2 + 11x - 7 = 2x^3 + hx^2 + 3x - 8x^2 - 4hx - 12 + k \\ -2x^3 \end{array}$$

$$-10x^2 + 11x - 7 = \underbrace{hx^2 - 8x^2} - \underbrace{4hx + 3x} - \underbrace{12 + k}$$

$$\begin{array}{lll} -10x^2 = hx^2 - 8x^2 & 11x = -4hx + 3x & -7 = -12 + k \\ -2x^2 = hx^2 & 8x = -4hx & 5 = k \\ -2 = h & -2 = h & \end{array}$$

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11. Similar question

Algebraically determine the values of h and k to correctly complete the identity stated below:

$$3x^3 - 2x^2 - 13x + 8 = (x - 2)(3x^2 + hx - 5) + k$$

$$3x^3 - 2x^2 - 13x + 8 = x(3x^2 + hx - 5) - 2(3x^2 + hx - 5) + k$$

$$\begin{array}{r} 3x^3 - 2x^2 - 13x + 8 = 3x^3 + hx^2 - 5x - 6x^2 - 2hx + 10 + k \\ \hline \end{array}$$

$$\begin{array}{lll} -2x^2 = +hx^2 - 6x^2 & -13x = -5x - 2hx & 8 = 10 + k \\ 4x^2 = hx^2 & -8x = -2hx & -2 = k \\ 4 = h & 4 = h & \end{array}$$

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# End Behavior

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Warm-Up: Factor completely.

$$x^5 - 4x^3 - x^2 + 4$$

$$x^3(x^2 - 4) - 1(x^2 - 4)$$

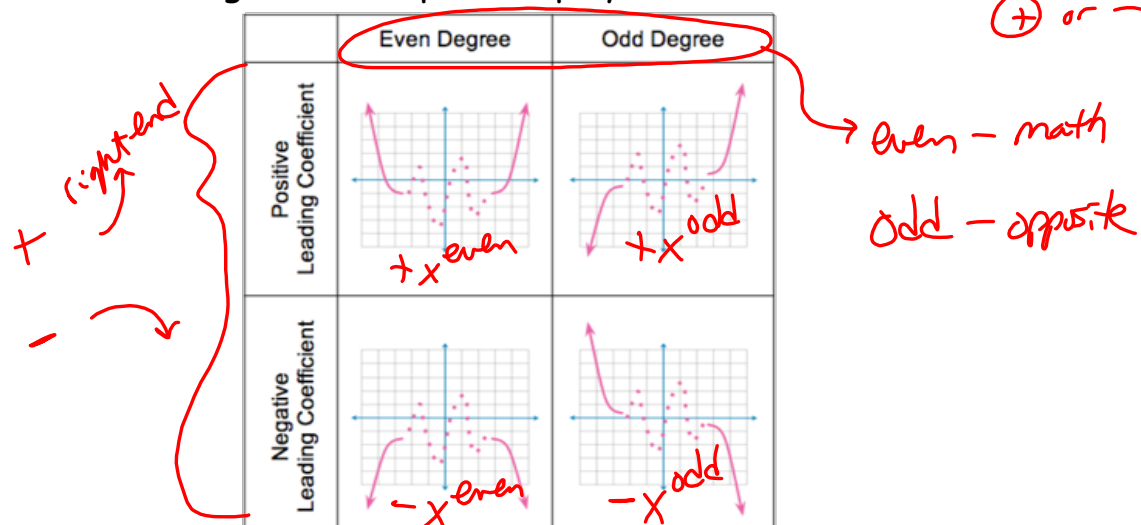
$$(x^2 - 4)(x^3 - 1)$$

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

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The degree (highest power) and leading coefficient (coefficient of the highest power) of a polynomial determine the end behavior for that polynomial.

There are four general shapes for polynomials.



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Without your calculator:

- state degree
- state the sign of the leading coefficient
- sketch (no graph paper) the end behavior

1.  $P(x) = 2x^3 - 3x^2 + 4x + 7$

a. deg = 3 (odd)

b. lead c. = +

c. +x odd

2.  $P(x) = -4x^8 + 2x - 1$

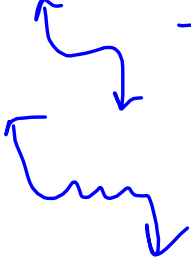
a. deg = 8 (even)

b. lead c. = -

c. -x even

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

a. deg = 5 (odd)b. lead c. = -c.   $-x^{\text{odd}}$ 

4.  $P(x) = 3x^4 + 2x^3 - 4x - 5$

a. deg = 4 (even)b. lead c. = +c.   $+x^{\text{even}}$ 

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So, what if our polynomial is in factored form?How would we find the degree and leading coefficient?Add the powers of  $x$  (add exponents) andSee if any of the coefficients of  $x$  are negative.

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$$-x \cdot x \cdot x = x^3$$

$$1. P(x) = -x(x+2)(x-3)$$

a. deg = 3 (odd)

b. lead coef = -

c.  $-x^{\text{odd}}$   


$$x \cdot x^2 \cdot x = x^4$$

$$2. P(x) = -x(x-1)^2(2x+3)$$

a. deg = 4 (even)

b. lead coef = -

c. 

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$$3. P(x) = x^3(x+2)(x-1)$$

a. deg = 5

b. lead c. = +

c. 

$$4. P(x) = (x-2)^2(x+1)$$

O =  $\frac{(x-2)^2(x+1)}{x=2 \mid x=-1}$

a. deg 3

b. lead c. = +

c. 

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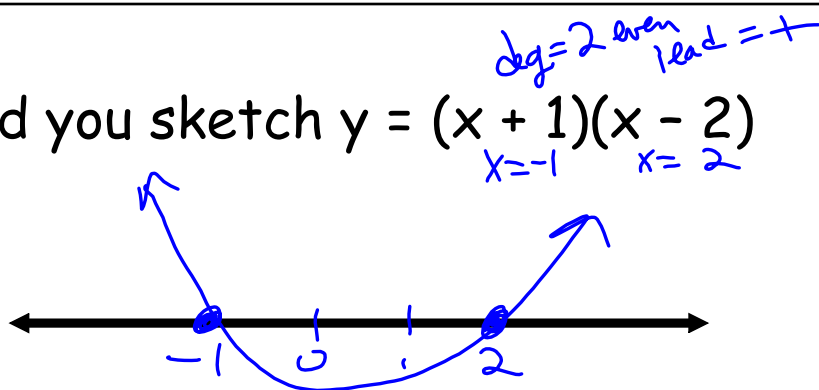
What else do we get from a polynomial in factored form?

zeros or roots or x-intercepts

Could we get a better sketch of our polynomial from factored form? How? use the zeros to sketch where the graph crosses the x-axis.

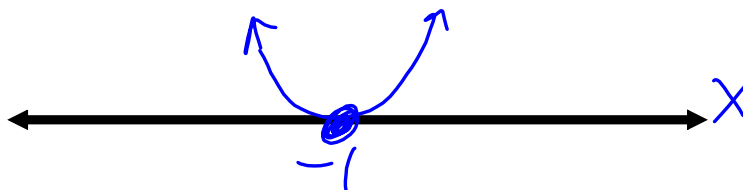
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How would you sketch  $y = (x + 1)(x - 2)$



How about  $y = (x + 1)^2 = 0$   
 $x = -1$

$$\frac{(x+1)(x+1)=0}{x=-1 \mid x=-1}$$



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$$x^7 - x^6 + 3x$$