

Unit 5 Day 1

Factoring Higher Degree Polys

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Factor by grouping:

- $8r^3 - 64r^2 + r - 8$
 $= 8r^2(r-8) + 1(r-8)$
 $= (r-8)(8r^2+1)$
- $12p^3 - 21p^2 + 28p - 49$
 $= 3p^2(4p-7) + 7(4p-7)$
 $= (4p-7)(3p^2+7)$
- $(x-2)(x-1) - (x-2)(x+1)$
 $= (x-2)(x-1 - (x+1))$
 $= (x-2)(x-1-x-1)$
 $= (x-2)(-2)$
 $= -2(x-2)$

GCF

- $x^2 - 4x^2 - x^2 + 4x$
 $= x^2(x^2-4) - x^2(x^2-4)$
 $= (x^2-4)(x^2-x)$
 $= (x-2)(x+2) \cdot x(x-1)$
 $= x(x-2)(x+2)(x-1)(x+1)$

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Review Long Product/Sum.

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

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Factor by Substitution with Product Sum.

- $x^2 - 2x - 3$
 $= (x-3)(x+1)$
- $(x^2 - 2x)^2 - 2(x^2 - 2x) - 3$
 $\text{Let } a = x^2 - 2x$
 $= a^2 - 2a - 3$
 $= (a-3)(a+1)$
 $= (x^2 - 2x - 3)(x^2 - 2x + 1)$
 $= (x-3)(x+1)(x-1)(x-1)$
- $(3x^2 + x)^2 - 6(3x^2 + x) + 8$
 $\text{Let } u = 3x^2 + x$
 $= u^2 - 6u + 8$
 $= (u-4)(u-2)$
 $= (3x^2 + x - 4)(3x^2 + x - 2)$
 $= (3x+4)(x-1)(x+1)(3x-2)$
- $2x^4 - 7x^2 - 4 + 3x^3 - 12x$
 $= (x^2-4)(2x^2+1) + 3x(x^2-4)$
 $= (x^2-4)(2x^2+1+3x)$
 $= (x-2)(x+2)(2x^2+3x+1)$
 $= (x-2)(x+2)(x+1)(2x+1)$

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Remember: Sum and Difference of Two Cubes
 Keep Change Plus

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

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

- $x^3 - 8 = (x-2)(x^2+2x+4)$
 $a = \sqrt[3]{x^3} = x$
 $b = \sqrt[3]{8} = 2$

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- $27x^6 + 1$
 $= (3x^2+1)(9x^4-3x^2+1)$
 $= (3x^2+1)(3x^2+1)(3x^2-1)$
 $= (3x^2+1)^2(3x^2-1)$

$a = \sqrt[3]{27x^6} = 3x^2$
 $b = \sqrt[3]{1} = 1$

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13. $y^6 - 64$ tricky, tricky

$a = \sqrt[3]{y^6} = y^2$
 $b = \sqrt[3]{64} = 4$

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

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Given 1 is a zero of the function $f(x) = x^4 - 4x^3 + 2x^2 + 4x - 3$, find the remaining zeros.

$\{1, -1, 3, -1\}$

$(x-1) \overline{) x^4 - 4x^3 + 2x^2 + 4x - 3}$

$x^4 - x^3 - 3x^2 + 4x - 3$
 $\underline{-(x^4 - x^3 + x^2 - 3x + 3)}$
 $-3x^2 + 7x - 6$
 $\underline{-3x^2 + 3x + 3}$
 $4x - 9$
 $\underline{-(4x - 4)}$
 -5

$x^3 - 3x^2 - x + 3 = 0 \rightarrow -x(x-1) \rightarrow x^2 + 1x - 3 = 0$
 $x^2(x-3) - 1(x-3) = 0 \rightarrow 3(x-1) \rightarrow x^2 - 3x + 3 = 0$
 $(x-3)(x^2 - 1) = 0$

$x-3=0 \quad x-1=0 \quad x+1=0$
 $x=3 \quad x=1 \quad x=-1$

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