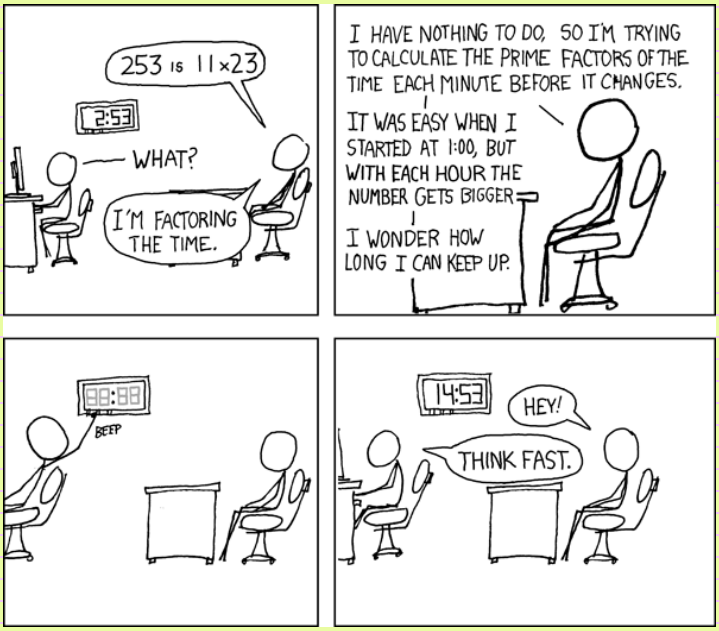
Unit 5 Day 1

Factoring Higher Degree Polys



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Factor by grouping:

1. $8r^3 - 64r^2 + r - 8$

$= 8r^2(r-8) + 1(r-8)$

$= (r-8)(8r^2+1)$

2. $12p^3 - 21p^2 + 28p - 49$

$= 3p^2(4p-7) + 7(4p-7)$

$= (4p-7)(3p^2+7)$

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

$= (x-2)[(x-1) - (x+1)]$

$= (x-2)[x-1-x-1]$

$= (x-2)(-2)$

$= -2(x-2)$

4. $x^7 - 4x^5 - x^3 + 4x$

$= x^5(x^2-4) - x(x^2-4)$

$= (x^2-4)(x^5-x)$

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

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

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

$\sqrt{x^4} = x^2$

$\sqrt{1} = 1$

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Review Long Product/Sum.

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

$p = -12$, $s = 1$, $-3, +4$

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

$= 3x(x-1) + 4(x-1)$

$= (x-1)(3x+4)$

6. $2x^2 - 7x - 4$

$p = -8$, $s = -7$, $1, -8$

$= 2x^2 - 8x + 1x - 4$

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

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

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Factor by Substitution with Product Sum.

7. $x^2 - 2x - 3$

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

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

Let $m = x^2 - 2x$

$= m^2 - 2m - 3$

$= (m+1)(m-3)$

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

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

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

$p = -8, s = -7$, $1, 8$

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

Let $m = 3x^2 + x$

$= m^2 - 6m + 8$

$= (m-4)(m-2)$

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

$p = -12, s = 1$, $-3, 4$

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

$= 3x(x-1) + 4(x-1)$

$= (x-1)(3x+4)$

$p = -6, s = 1$, $3, -2$

$3x^2 + 3x - 2x - 2$

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

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

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

10. $2x^4 - 7x^2 - 4 + 3x^3 - 12x$

$= 2x^4 - 8x^2 + 1x^2 - 4 + 3x(x^2 - 4) + 3x(x+2)(x-2)$

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

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

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

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

$p = 2, s = 3$, $1, 2$

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

$2x^2 + 2x + 1x + 1$

$2x(x+1) + 1(x+1)$

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

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Remember: Sum and Difference of Two Cubes

keep change change

$a = \sqrt[3]{a^3}$
$b = \sqrt[3]{b^3}$

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

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

$a = \sqrt[3]{x^3} = x$ $b = \sqrt[3]{8} = 2$

11. $x^3 - 8 = (x-2)(x^2+2x+2^2)$
$= (x-2)(x^2+2x+4)$

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

12. $27x^6 + 1$ $x^2 \cdot x^2 = x^4$

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

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

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tricky, tricky

13. $y^6 - 64$

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

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

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

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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. $f(x) = 0$

1 is a zero

$x^2 - 2x + 1 = 0$

$(x-1)(\quad) = 0$

$x - 1 = 0$

$x = 1$

$x-1 \overline{)\, x^2 - 2x + 1}$

$x^3(x-1) \rightarrow -(x^4 - x^3)$

$-3x^3$

$x-1$ is a factor

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

$x^3 - 3x^2 - x + 3$

$x^3 - 3x^2 - x + 3 = 0$

$(x-3)(x^2-1) = 0$

$x = 3 \quad | \quad x^2 = 1$

$x = \pm 1$

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

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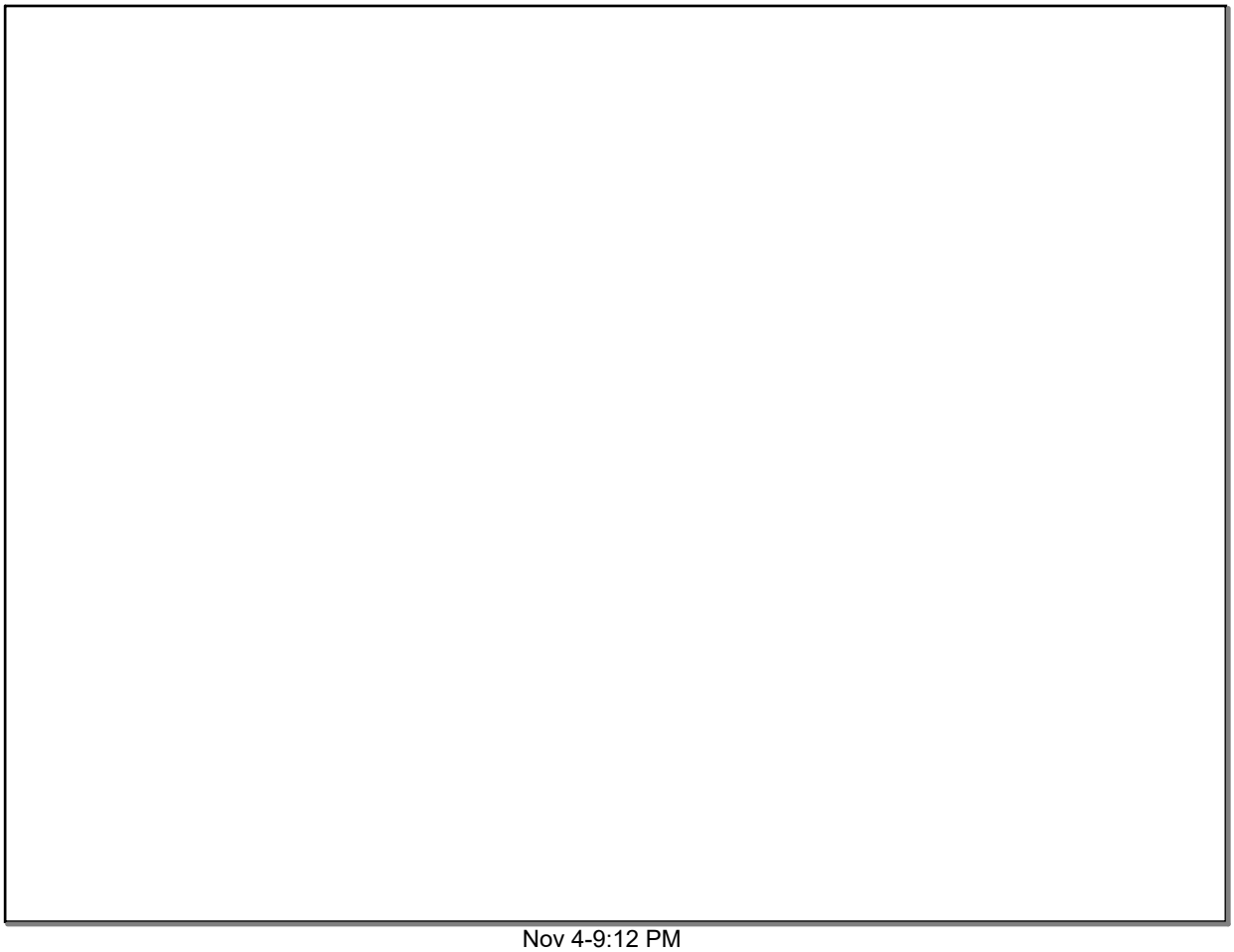

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