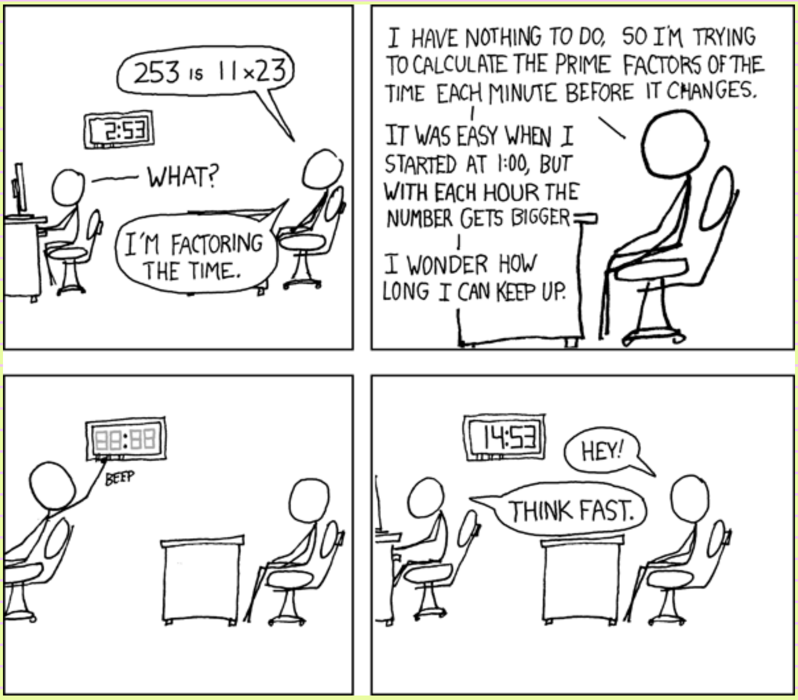
Unit 5 Day 1

Factoring Higher Degree Polys



Factor by grouping:

1. $\underbrace{8r^3 - 64r^2} + \underbrace{r - 8}$

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

$\boxed{(r-8)(8r^2+1)}$

2. $\underbrace{12p^3 - 21p^2} + \underbrace{28p - 49}$

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

$\boxed{(4p-7)(3p^2+7)}$

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

$(x-2)\left[(x-1)-(x+1)\right]$

$x-1 \; -x-1$

$(x-2)(-2)$

$\boxed{-2(x-2)}$

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

$x(\underbrace{x^6-4x^4}\underbrace{-x^2+4})$

$x\left[x^4(x^2-4)-1(x^2-4)\right]$

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

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

$\boxed{x(x+2)(x-2)(x+1)(x-1)(x^2+1)}$

Review Long Product/Sum.

5. $\overset{a}{3}x^2 + \overset{b}{x} - \overset{c}{4}$

$P = a \cdot c = -12$

$S = b = 1$

$4, -3$

$\underbrace{3x^2 + 4x}\ \underbrace{-3x - 4}$

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

$\boxed{(3x+4)(x-1)}$

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

$P = -8$

$S = -7$

$-8, 1$

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

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

$\boxed{(2x+1)(x-4)}$

Factor by Substitution with Product Sum.

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

$P=-3$
$S=-2$
$-3, 1$

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

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

Let $u = x^2 - 2x$

$u^2 - 2u - 3$

$(u-3)(u+1)$

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

$\boxed{(x-3)(x+1)(x-1)(x-1)}$

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

u u

Let $u = 3x^2 + x$

$u^2 - 6u + 8$

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

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

long(s)

long(s)

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

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

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

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

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

$\boxed{(x-2)(x+2)(2x+1)(x+1)}$

#10 $2x^4 - 7x^2 - 4$

$P=-8$
$S=-7$
$-8, 1$

$\underline{2x^4 - 8x^2} + x^2 - 4$

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

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

Remember: Sum and Difference of Two Cubes

SOAP

same opp. always positive

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

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

11. $x^3 - 8$

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

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

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

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

12. $27x^6 + 1$

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

$b = \sqrt[3]{1} = 1$

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

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

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

13. $y^6 - 64$

tricky, tricky

If both DOTS and $a^3 \pm b^3$
then use $a^3 \pm b^3$ 1st.

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

therefore ... $(x-1)$ is a factor of $f(x)$

D $\frac{x^4}{x} = x^3$

M $x^3(x-1)$

S Negate both

BD

$$
\begin{array}{r|l}
 & x^3 - 3x^2 - x + 3 \\
x-1 & \cancel{x^4} - 4x^3 + 2x^2 + 4x - 3 \\
 & -\cancel{x^4} + x^3 \\
 & -3\cancel{x^3} + 2x^2 \\
 & +\cancel{3x^3} - 3x^2 \\
 & -x^2 + 4x \\
 & +x^2 - x \\
 & 3x - 3 \\
 & -3x + 3 \\
 & 0
\end{array}
$$

$$\underbrace{x^3 - 3x^2} \underbrace{- x + 3} = 0$$

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

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

$$(x-3)(x-1)(x+1) = 0$$

$x = 3$ | $x = 1$ | $x = -1$

$\{3, \pm 1\}$