

Factor by grouping

* 4 terms

$$\overset{1}{2}x^3 + \overset{2}{8}x^2 - \overset{3}{8}x - \overset{4}{32}$$

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

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

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

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

Diff 2 sq.

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

① GCF

* Rewrite the problem *

② Group the 1st 2 terms together
Group the 2nd 2 terms

③ Pull out a GCF from each set of parentheses
(is what's left identical?)

④ Rewrite

⑤ Can anything else be factored?

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

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

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

Factoring by Grouping

a.k.a. Factoring in "Pairs"

Who? 4 terms

What? Polynomials

How? Very Carefully ☺

Steps	
**	GCF!
1)	Pair up terms
2)	Factor out GCF from Pairs
3)	Check that the parentheses are identical
4)	Rewrite

Example: $9x^3 - 9x^2 - 4x + 4$

① $(9x^3 - 9x^2)(-4x + 4)$

② $9x^2(x - 1) - 4(x - 1)$

③ $(9x^2 - 4)(x - 1)$

④ $(3x + 2)(3x - 2)(x - 1)$

Factor again if you can!