Factor by Grouping

- a type of factoring typically used when given 4 parts and/or more than a quadratic

the method:

ex $8r^3-64r^2+r-8$ factor

step 1: think about it as two parts

$\underbrace{8r^3-64r^2}_{\text{part 1}}+\underbrace{r-8}_{\text{part 2}}$

step 2: what can I divide out from each part?

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

(they only have 1 in common)

step 3: The back piece (ex. "r-8") should match & the factors divided out become the other factor

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

$(8r^2+1)(r-8)$ ← final answer

* note: when you get to the final answer make sure the pieces cannot factor further *

ex 2 $12x^3+2x^2-30x-5$

$2x^2(6x+1)-5(6x+1)$ ← divide out the negative as well to make both ( ) "6x+1"

$(2x^2-5)(6x+1)$

solve by factoring

① set equal to zero

② factor

③ set each piece equal to zero & solve for x

*note : only real roots, not imaginary #s unless asked for them *

examples

1. $8r^3 - 64r^2 + r - 8 = 0$

$8r^2(r-8) + 1(r-8) = 0$

$(8r^2+1)(r-8) = 0$

$8r^2 + 1 = 0$

$8r^2 = -1$

$r^2 = -1/8$

non real.

$r - 8 = 0$

$\boxed{r = 8}$

*when you do this you are finding the roots *

2. $12x^3 + 2x^2 - 30x - 5 = 0$

$2x^2(6x+1) - 5(6x+1) = 0$

$(2x^2-5)(6x+1) = 0$

$2x^2 - 5 = 0$

$2x^2 = 5$

$x^2 = \frac{5}{2}$

$\boxed{x = \pm\sqrt{\frac{5}{2}}}$

$6x + 1 = 0$

$6x = -1$

$\boxed{x = -1/6}$