F Michaelmas Factorisation Harder

Patrons are reminded that they must always factorise out the *lowest* power of any common factors. So given $a^6 - 4a^5$, factorise out the a^5 to get $a^5(a-4)$.

Also, when you see something like

$$8x^3(x-1)^6 - 4x^2(x-1)^7$$

notice that the brackets are the same, so you can think about it as

$$8x^3k^6 - 4x^2k^7.$$

So we factorise out the 4, the x^2, and the k^6 (which is $(x-1)^6$). So

$$\begin{aligned} &8x^3(x-1)^6 - 4x^2(x-1)^7, \\ =\ &4x^2(x-1)^6\left[2x-(x-1)\right], \\ =\ &4x^2(x-1)^6(x+1). \end{aligned}$$

[Beylin, notice the equals signs are lined up.]

Factorise fully the following:

1. $x(x+1)+2(x+1)$. $\boxed{(x+1)(x+2)}$
2. $2x(x-1)-3(x-1)$. $\boxed{(x-1)(2x-3)}$
3. $x(x+y)+y(x+y)$. $\boxed{(x+y)^2}$
4. $p(p-2q)+q(p-2q)$. $\boxed{(p-2q)(p+q)}$
5. $4x(x-3)+8(x-3)$. $\boxed{4(x-3)(x+2)}$
6. $x^5(x-5)-x^4(x-5)$. $\boxed{x^4(x-5)(x-1)}$
7. $7x^2(x+1)^5+14x(x+1)^6$. $\boxed{7x(3x+2)(x+1)^5}$
8. $27x^8(x-1)^8-9x^9(x-1)^7$. $\boxed{9x^8(2x-3)(x-1)^7}$
9. $2x^4(x-1)^4+8x^3(x-1)^3$. $\boxed{2x^3(x-1)^3(x^2-x+4)}$
10. $(2x-1)^7(2x+3)^4-(2x-1)^8(2x+3)^3$. $\boxed{4(2x-1)^7(2x+3)^3}$
11. $10(t+2)^6(t+3)^4-5(t+2)^7(t+3)^3$. $\boxed{5(t+4)(t+2)^6(t+3)^3}$
12. $7x^3(x-1)^8(2x+1)^3-14x(x-1)^9(2x+1)^2$. $\boxed{7x(2x+1)^2(x-1)^8(2x^3+x^2-2x+2)}$
13. $27(2t-1)^2(t+1)^2-18(2t-1)(t+1)^3$. $\boxed{9(2t-1)(4t-5)(t+1)^2}$
14. $y^4(y+7)^4(2y-1)^2-2y^2(y+7)^3(2y-1)$. $\boxed{y^2(2y-1)(y+7)^3(2y^4+13y^3-7y^2-2)}$
15. $6(2z+5)^7(z-1)^{10}-12(2z+5)^6(z-1)^{11}$. $\boxed{42(z-1)^{10}(2z+5)^6}$