

Factoring by Grouping

Factor each expression.

$$\begin{aligned}\textcircled{1} \quad 3n^3 - 12n^2 + 2n - 8 &= 3n^2(n-4) + 2(n-4) \\ &= \boxed{(3n^2 + 2)(n-4)}\end{aligned}$$

$$\begin{aligned}\textcircled{2} \quad 8t^3 + 14t^2 + 20t + 35 &= 2t^2(4t+7) + 5(4t+7) \\ &= \boxed{(2t^2 + 5)(4t+7)}\end{aligned}$$

$$\begin{aligned}\textcircled{3} \quad 4q^4 - 8q^3 + 12q^2 - 24q &= 4q(q^3 - 2q^2 + 3q - 6) \\ &= 4q[q^2(q-2) + 3(q-2)] \\ &= \boxed{4q(q^2 + 3)(q-2)}\end{aligned}$$

$$\begin{aligned}\textcircled{4} \quad 6h^4 + 9h^3 + 12h^2 + 18h &= 3h(2h^3 + 3h^2 + 4h + 6) \\ &= 3h[h^2(2h+3) + 2(2h+3)] \\ &= \boxed{3h(h^2 + 2)(2h+3)}\end{aligned}$$