Exercice 4.

a)

$$\begin{aligned} & x^3+2x^2-x-2=0 && \mid \text{ groupements} \\ \iff & x^2(x+2)-(x+2)=0 && \mid \\ \iff & (x+2)(x^2-1)=0 && \mid \ a^2-b^2=... \\ \iff & (x+2)(x+1)(x-1)=0 \end{aligned}$$

$$\Rightarrow \boxed{S=\{-2\,;-1\,;1\}}$$

b)

$$\begin{aligned} & x^3-3x^2-4x+12=0 && \mid \text{ groupements} \\ \iff & x^2(x-3)-4(x-3)=0 && \mid \\ \iff & (x-3)(x^2-4)=0 && \mid \ a^2-b^2=... \\ \iff & (x-3)(x+2)(x-2)=0 \end{aligned}$$

$$\Rightarrow \boxed{S=\{-2\,;2\,;3\}}$$

c)

$$\begin{aligned} & 4x^5-12x^4+9x^3=0 && \mid \text{ mise en évidence} \\ \iff & x^3(4x^2-12x+9)=0 && \mid \ a^2-2ab+b^2=... \\ \iff & x^3(2x-3)^2=0 \end{aligned}$$

$$\Rightarrow \boxed{S=\{0\,;3/2\}}$$

d)

$$\begin{aligned} & 16x^3-16x^2-4x+4=0 && \mid \text{ mise en évidence} \\ & 4(4x^3-4x^2-x+1)=0 && \mid \text{ groupements} \\ \iff & 4[4x^2(x-1)-(x-1)]=0 && \mid \\ \iff & 4(x-1)(4x^2-1)=0 && \mid \ a^2-b^2=... \\ \iff & 4(x-1)(2x+1)(2x-1)=0 \end{aligned}$$

$$\Rightarrow \boxed{S=\{-1/2\,;1/2\,;1\}}$$