Exercise 2B

Question 18:

$\sqrt{5}$ and $-\sqrt{5}$ are the zeros of the polynomial

$x^4 + 4x^3 - 2x^2 - 20x - 15$

$\therefore (x-\sqrt{5})(x+\sqrt{5}) = x^2 - 5$ will divide the given polynomial completely.

Dividing $x^4 + 4x^3 - 2x^2 - 20x - 15$ by $x^2 - 5$, we get

$$
\begin{array}{r|l}
x^2 - 5 & x^2 + 4x + 3 \\
\hline
 & x^4 + 4x^3 - 2x^2 - 20x - 15 \\
 & x^4 \quad\quad - 5x^2 \\
 & - \quad\quad + \\
\hline
 & 4x^3 + 3x^2 - 20x \\
 & 4x^3 \quad\quad - 20x \\
 & - \quad\quad + \\
\hline
 & 3x^2 \quad - 15 \\
 & 3x^2 \quad - 15 \\
 & - \quad\quad + \\
\hline
 & 0
\end{array}
$$

$$\text{Quotient} = x^2 + 4x + 3 = x^2 + 3x + x + 3$$
$$= x(x+3) + (x+3) = (x+3)(x+1)$$

Other zeros of the given polynomial are the zeros of $q(x)$

$\therefore \quad q(x) = 0$ or $(x+3)(x+1) = 0$

$\Rightarrow \quad x = -3, -1$

Thus, the zeros of the given polynomial are

$\sqrt{5}, -\sqrt{5}, -3, -1$

********** END **********