2(ii) $g(x) = x^2 + 3x + 1$

$p(x) = 3x^4 + 5x^3 - 7x^2 + 2x + 2$

$$
\begin{array}{r|l}
 & 3x^2 - 4x + 2 \\
\hline
x^2+3x+1 & 3x^4 + 5x^3 - 7x^2 + 2x + 2 \\
 & 3x^4 + 9x^3 + 3x^2 \\
 & - \quad - \quad - \\
\hline
 & -4x^3 - 10x^2 + 2x + 2 \\
 & -4x^3 - 12x^2 - 4x \\
 & + \quad + \quad + \\
\hline
 & 2x^2 + 6x + 2 \\
 & 2x^2 + 6x + 2 \\
 & - \quad - \quad - \\
\hline
 & 0
\end{array}
$$

$\because$ remainder $= 0$

$\therefore$ $g(x)$ is a factor of $p(x)$

2(iii) $g(x) = x^3 - 3x + 1$

$p(x) = x^5 - 4x^3 + x^2 + 3x + 1$

$$
\begin{array}{r|l}
 & x^2 - 1 \\
\hline
x^3-3x+1 & x^5 - 4x^3 + x^2 + 3x + 1 \\
 & x^5 - 3x^3 + x^2 \\
 & - \quad + \quad - \\
\hline
 & -x^3 + 3x + 1 \\
 & -x^3 + 3x - 1 \\
 & + \quad - \quad + \\
\hline
 & 2
\end{array}
$$

$\because$ remainder $\neq 0$

$\therefore$ g(x) is not a factor of p(x)