h) $\displaystyle\int \frac{x^2-1}{x(x^2+4)}\,dx = \int\left(\frac{-1/4}{x} + \frac{\frac{5}{4}x}{x^2+4}\right)dx = -\frac{1}{4}\ln|x| + \frac{5}{8}\ln(x^2+4) + C$

$\displaystyle\frac{x^2-1}{x(x^2+4)} = \frac{A}{x} + \frac{Bx+C}{x^2+4} \rightarrow x^2-1 = A(x^2+4) + x(Bx+C)$

$\text{si } x=0 \rightarrow -1 = 4A \longrightarrow A = -1/4$

$\text{si } x=1 \rightarrow 0 = 5A+B+C$

$\text{si } x=-1 \rightarrow 0 = 5A+B-C$

$+ \quad 0 = 10A + 2B \longrightarrow B = \frac{10}{4}\cdot\frac{1}{2} = \frac{5}{4}$

$\longrightarrow C = 0$

i) $\displaystyle\int \frac{x^4+x^2-2x}{x^3-2}\,dx = \int \frac{x(x^3-2)+x^2}{x^3-2}\,dx$

$$\begin{array}{l|l} x^4+x^2-2x & x^3-2 \\ \hline -(x^4 \quad\; -2x) & x \\ \hline x^2 & \end{array}$$

$\displaystyle = \int x\,dx + \frac{1}{3}\int \frac{3x^2}{x^3-2}\,dx$

$\displaystyle = \frac{x^2}{2} + \frac{1}{3}\ln|x^3-2| + C$

j) $\displaystyle\int \frac{\sqrt[3]{x}+1}{3x}\,dx = \frac{1}{3}\int\left(x^{-\frac{2}{3}} + \frac{1}{x}\right)dx = \frac{1}{3}\left(\frac{x^{\frac{1}{3}}}{\frac{1}{3}} + \ln|x|\right) + C$

$\displaystyle = \sqrt[3]{x} + \frac{1}{3}\ln|x| + C$

2) a) $\displaystyle f(x) = g(x) \iff x^2 - \frac{x}{2} - 5 = 0 \qquad \Delta = \frac{1}{4} + 20 = \frac{81}{4}$

$\displaystyle \iff x = \frac{5}{2} \text{ ou } x = -2$

b) $\displaystyle A = \int_{-2}^{5/2}\left[\frac{x}{2}+1-(x^2-4)\right]dx = \int_{-2}^{5/2}\left(-x^2+\frac{x}{2}+5\right)dx$

$\displaystyle = \left[-\frac{x^3}{3} + \frac{x^2}{4} + 5x\right]_{-2}^{5/2}$

$\displaystyle = \left(-\frac{125}{24} + \frac{25}{16} + \frac{25}{2}\right) - \left(\frac{8}{3} + 1 - 10\right) = \frac{243}{16}$

$= 15{,}1875$ (ua)