

**partial fractions**

Use the method of partial fractions (and polynomial division) to evaluate these integrals:

1.

$$\begin{aligned}\int \frac{1-x}{x^2+3x+2} dx &= \int \frac{2}{x+1} - \frac{3}{x+2} dx \\ &= 2 \ln|x+1| - 3 \ln|x+2| + C\end{aligned}$$

2.

$$\begin{aligned}\int \frac{x^3+4x^2+4x+3}{x^2+3x+2} dx &= \int x+1 + \frac{1-x}{x^2+3x+2} dx \\ &= \frac{1}{2}x^2 + x + 2 \ln|x+1| - 3 \ln|x+2| + C\end{aligned}$$

3.

$$\begin{aligned}\int \frac{x^3+1}{x^3-x^2} dx &= \int 1 + \frac{x^2+1}{x^3-x^2} dx = \\ \int 1 + \frac{2}{x-1} - \frac{1}{x} - \frac{1}{x^2} dx &= x + 2 \ln|x-1| - \ln|x| + \frac{1}{x} + C\end{aligned}$$

4.

$$\begin{aligned}\int \frac{x-2}{x^3+x} dx &= \int \frac{2x+1}{x^2+1} - \frac{2}{x} dx \\ = \int \frac{2x}{x^2+1} + \frac{1}{x^2+1} - \frac{2}{x} dx &= \ln(x^2+1) + \tan^{-1}x - 2 \ln|x| + C\end{aligned}$$