

Section 3: Further integration

Exercise level 3 solutions

$$1. \frac{1}{x^2 + 2x + k} = \frac{1}{(x+1)^2 - 1 + k}$$

If $k \geq 2$, the constant term is positive so you can use an arctan integration

$$\text{If } k = 1, \text{ you have } \int \frac{1}{(x+1)^2} dx = -\frac{1}{x+1} + c$$

If $k = 0$, you have $\int \frac{1}{x(x+1)} dx$ so you can use partial fractions

If $k \leq -1$, the constant term is negative so the denominator can be written as the difference of two squares and you can use partial fractions.