

solve by matrix algebra²³⁶¹⁰.^{7, 10, 100}
 using only real numbers.
 (if $T(x)$ is rational with
 real coefficients).

$$\frac{3x+5}{(x+2)(x^2+4x+6)} = \frac{-\frac{1}{2}}{x+2} + \frac{g_1x+g_0}{x^2+4x+6}$$

$$\begin{aligned} (3x+5) &= \left(-\frac{1}{2}\right)(x^2+4x+6) \\ &\quad + (g_1x+g_0)(x+2) \\ &= -\frac{1}{2}x^2 - 2x - 3 \\ &\quad + g_1x^2 + 2g_1x + g_0x + 2g_0 \end{aligned}$$

$$1: 5 = -3 + 2g_0 \quad \Rightarrow g_0 = 4$$

$$x: 3 = -2 + 2g_1 + g_0$$

$$x^2: 0 = -\frac{1}{2} + g_1 \quad \Rightarrow g_1 = \frac{1}{2}$$

$$\begin{aligned} \text{a check from } x \text{ term: } -2 + 2g_1 + g_0 \\ = -2 + 1 + 4 = 3 \end{aligned}$$