

# Numerical Analysis

## MATLAB Assignment 2 Bonus

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Problem: Calculate by hand:

$$\int_0^{0.35} \frac{1}{x^2 - 4} dx$$

$$\frac{1}{x^2 - 4} = \frac{1}{(x - 2)(x + 2)} = \frac{A}{x - 2} + \frac{B}{x + 2} \implies 1 = A(x + 2) + B(x - 2)$$

Choose  $x = 2$ :

$$1 = 4A \implies A = \frac{1}{4}$$

Choose  $x = -2$ :

$$1 = -4B \implies B = -\frac{1}{4}$$

Thus  $\frac{1}{x^2 - 4} = \frac{1}{4(x - 2)} - \frac{1}{4(x + 2)}$ . We now calculate:

$$\begin{aligned} \int_0^{0.35} \frac{1}{4(x - 2)} - \frac{1}{4(x + 2)} dx &= \frac{1}{4} \left( - \int_0^{0.35} \frac{1}{2 - x} dx - \int_0^{0.35} \frac{1}{x + 2} dx \right) \\ &= \frac{1}{4} \left( [\ln(2 - x)]_0^{0.35} + [\ln(x + 2)]_0^{0.35} \right) \\ &= \frac{1}{4} (\ln(1.65) - \ln(2) - \ln(2.35) + \ln(2)) \\ &= \frac{1}{4} \ln \left( \frac{1.65}{2.35} \right) \\ &\approx -0.088410010061 \end{aligned}$$

So  $\int_0^{0.35} \frac{1}{x^2 - 4} dx \approx -0.088410010061$