

Sheet 3 - Raytracing

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Practical part

Please find the solution in the accompanying .py file.

Theoretical Part

Assignment 3) Cumulative Distribution Function

0.0.1 a)

The cumulative distribution function F of the PDF f is defined as the integral

$$F(x) = \int_{-\infty}^x f(x') dx',$$

which can be interpreted as the probability of a random variable X with probability distribution f having a value $X \leq x$.

0.0.2 b)

We can use this fact to get

$$\begin{aligned} P(0 < X < 1.5) &= F(1.5) - F(0) = \int_{-\infty}^{1.5} f(x) dx = \int_0^1 x dx + \int_1^{1.5} -x + 2 dx \\ &= \left[\frac{1}{2} x^2 \right]_0^1 + \left[-\frac{1}{2} x^2 + 2x \right]_1^{1.5} \\ &= \frac{1}{2} - \frac{1}{2} \cdot \frac{9}{4} + 2 \cdot \frac{3}{2} - \left(-\frac{1}{2} + 2 \right) \\ &= \frac{1}{2} - \frac{9}{8} + 3 + \frac{1}{2} - 2 = \frac{7}{8}. \end{aligned}$$