Mathematics with Computer Science

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Fachbereich Mathematik
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Introductory Course
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Exercises Unit 9

1. Determine the area between the graphs of the following functions:

$$f_1(x) = \begin{cases} 4 & \text{for } 3 \leq x \leq 19 \\ 0 & \text{otherwise,} \end{cases}$$

$$f_2(x) = \begin{cases} (x-1)^2 & \text{for } x \geq 1 \\ 0 & \text{for } x < 1, \end{cases}$$

$$f_3(x) = \sqrt{x-3}.$$

2. Show

$$\int_{-\pi/2}^{\pi/2} \sin^2 x \, dx = \int_{-\pi/2}^{\pi/2} \cos^2 x \, dx = \frac{\pi}{2}.$$

3. Show, that

$$\int_a^b \cos x \, dx = \sin x \Big|_a^b \qquad \text{und} \qquad \int_a^b \sin x \, dx = -\cos x \Big|_a^b$$

   by using the definition by power series. You can use that the power series are absolutly convergent, so you can exchange differantion and series.

4. Determine the primitve of the following functions:

   a) $f(x) = \cos(x)\sin(x)$

   b) $g(x) = xe^x$