

Exercise session

Problem 1.

Compute the indefinite integrals:

$$\text{a) } \int \frac{4}{4-x} dx \qquad \text{b) } \int \frac{4}{4-x^2} dx \qquad \text{c) } \int \frac{4x}{4-x^2} dx \qquad \text{d) } \int \frac{x^2}{4-x^2} dx$$

Problem 2.

Compute the indefinite integrals:

$$\begin{aligned} \text{a) } \int \frac{1}{1-x^2} dx & \qquad \text{b) } \int \frac{2x}{1-x^2} dx & \qquad \text{c) } \int \frac{x^2}{1-x^2} dx & \qquad \text{d) } \int \frac{x^2-2x+1}{1-x^2} dx \\ \text{e) } \int \frac{1}{(1-x)^2} dx & \qquad \text{f) } \int \frac{2x}{(1-x)^2} dx & \qquad \text{g) } \int \frac{x^2}{(1-x)^2} dx & \qquad \text{h) } \int \frac{x^2-2x+1}{(1-x)^2} dx \end{aligned}$$

Problem 3.

Compute the indefinite integrals:

$$\text{a) } \int x e^{1-x^2} dx \qquad \text{b) } \int x \ln(1-x) dx \qquad \text{c) } \int \frac{x^3+x^2-2x-6}{x^2-1} dx$$

Problem 4.

Compute the indefinite integrals:

$$\text{a) } \int 2x^3 e^{-x^2} dx \qquad \text{b) } \int \sqrt{x} e^{\sqrt{x}} dx \qquad \text{c) } \int \frac{\sqrt{x}+1}{1-\sqrt{x}} dx$$

Problem 5.

Problems from the textbook: 10.5.1, 10.6.1 - 10.6.2, 10.6.8 - 10.6.9

Answers to exercise session problems

Problem 1.

$$\begin{aligned} \text{a) } -4 \ln |4-x| + C & \qquad \text{b) } \ln |2+x| - \ln |2-x| + C = \ln \left| \frac{2+x}{2-x} \right| + C \\ \text{c) } -2 \ln |2-x| - 2 \ln |2+x| + C = -2 \ln |4-x^2| + C & \qquad \text{d) } -x + \ln |2+x| - \ln |2-x| + C = -x + \ln \left| \frac{2+x}{2-x} \right| + C \end{aligned}$$

Problem 2.

$$\begin{array}{lll} \text{a) } \frac{1}{2} \ln \left| \frac{1+x}{1-x} \right| + \mathcal{C} & \text{b) } -\ln |1-x^2| + \mathcal{C} & \text{c) } -x + \frac{1}{2} \ln \left| \frac{1+x}{1-x} \right| + \mathcal{C} \\ \text{d) } -x + \ln \left| \frac{1+x}{1-x} \right| + \ln |1-x^2| + \mathcal{C} = -x + 2 \ln |1+x| + \mathcal{C} & & \text{e) } \frac{1}{1-x} + \mathcal{C} \\ \text{f) } 2 \ln |1-x| + \frac{2}{1-x} + \mathcal{C} & \text{g) } x + 2 \ln |1-x| + \frac{1}{1-x} + \mathcal{C} & \text{h) } x + \mathcal{C} \end{array}$$

Problem 3.

$$\begin{array}{ll} \text{a) } -\frac{1}{2} e^{1-x^2} + \mathcal{C} & \text{b) } \frac{1}{2} x^2 \ln(1-x) - \frac{1}{2} x - \frac{1}{4} x^2 - \frac{1}{2} \ln(1-x) + \mathcal{C} \\ \text{c) } \frac{1}{2} x^2 + x - 3 \ln |x-1| + 2 \ln |x+1| + \mathcal{C} = \frac{1}{2} x^2 + x + \ln \left| \frac{(x+1)^2}{(x-1)^3} \right| + \mathcal{C} & \end{array}$$

Problem 4.

$$\begin{array}{l} \text{a) } -x^2 e^{-x^2} - e^{-x^2} + \mathcal{C} \\ \text{b) } 2x e^{\sqrt{x}} - 4\sqrt{x} e^{\sqrt{x}} + 4e^{\sqrt{x}} + \mathcal{C} \\ \text{c) } 5 - 4\sqrt{x} - x - 4 \ln |1 - \sqrt{x}| + \mathcal{C} \end{array}$$

Problem 5.

See answers in the textbook.