

**Group A.****Ex. 1**

- a) Write the definition of an antiderivative. (1 point)
- b) Check whether the function  $F(x) = 5 - \arccos x$  is the antiderivative of  $f(x) = \frac{1}{\sqrt{1-x^2}}$ . (1 point)

**Ex. 2** Calculate the indefinite integrals:

$$\text{a) } \int x^2 \sin 2x dx, (2 \text{ points}) \qquad \text{b) } \int \frac{x^4}{x^{10}+3} dx, (2 \text{ points})$$

**Ex. 3** Calculate the indefinite integral:

$$\int \frac{\sin 2x}{1+3 \cos^2 x} dx, (2 \text{ points})$$

**Ex. 4** Calculate the indefinite integral:

$$\int \frac{x^3-2x^2-1}{x^2-1} dx, (3 \text{ points})$$

**Ex. 5** Calculate the definite integrals:

$$\text{a) } \int_1^2 \frac{x^3+\sqrt{x}-2}{x^2} dx, (2 \text{ points}) \qquad \text{b) } \int_2^4 \sqrt{2x+1} dx, (2 \text{ points})$$

**Group B.****Ex. 1**

- a) Write the definition of an antiderivative. (1 point)
- b) Check whether the function  $F(x) = 2 - \frac{1}{2} \cos 2x$  is the antiderivative of  $f(x) = \sin 2x$ . (1 point)

**Ex. 2** Calculate the indefinite integrals:

$$\text{a) } \int x^2 e^{3x} dx, (2 \text{ points}) \qquad \text{b) } \int \frac{\ln^3 x}{x} dx, (2 \text{ points})$$

**Ex. 3** Calculate the indefinite integral:

$$\int \frac{-\cos^3 x}{1+\sin^2 x} dx, (2 \text{ points})$$

**Ex. 4** Calculate the indefinite integral:

$$\int \frac{x^3-2x^2-1}{x^2-1} dx, (3 \text{ points})$$

**Ex. 5** Calculate the definite integrals:

$$\text{a) } \int_1^2 \frac{x-2}{\sqrt[3]{x}} dx, (2 \text{ points}) \qquad \text{b) } \int_1^5 \sqrt{2x-1} dx, (2 \text{ points})$$

**Group C.****Ex. 1**

- a) Write the definition of an antiderivative. (1 point)
- b) Check whether the function  $F(x) = 3 - \cos^2 x$  is the antiderivative of  $f(x) = \sin 2x$ . (1 point)

**Ex. 2** Calculate the indefinite integrals:

a)  $\int x^2 e^{5x} dx$ , (2 points)                      b)  $\int \frac{1}{x(1+\ln x)} dx$ , (2 points)

**Ex. 3** Calculate the indefinite integral:

$$\int \frac{\sin^3 x}{1+\cos^2 x} dx, (2 \text{ points})$$

**Ex. 4** Calculate the indefinite integral:

$$\int \frac{x^3+2x-6}{x^2-x-2} dx, (3 \text{ points})$$

**Ex. 5** Calculate the definite integrals:

a)  $\int_1^2 \frac{x^3+\sqrt{x}-2}{x^2} dx$ , (2 points)                      b)  $\int_2^4 \sqrt{2x+1} dx$ , (2 points)