Norwegian University of Science
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Department of Mathematical
Sciences

MA0002 Mathematical Methods B Spring 2023

Exercise set 1

1 Evaluate the indefinite integrals by making the given substitutions.

1. $\int 3x^2\sqrt{x^3+1}\,dx$ with $u = x^3 + 1$
2. $\int x\cos(x^2-1)\,dx$, with $u = x^2 - 1$
3. $\int 3e^{1-x}\,dx$, with $u = 1 - x$
4. $\int \frac{x}{5-x}\,dx$, with $u = 5 - x$

2 Use substitution to evaluate the indefinite integrals.

1. $\int (4-x)^{1/7}\,dx$
2. $\int (x^2-2x)(x^3-3x^2+3)^{2/3}\,dx$
3. $\int \cos x\; e^{\sin x}\,dx$

3 Let $g(x)$ be a continuous function whose derivative $g'(x)$ is also continuous. Use substitution to evaluate the indefinite integral

$$\int g'(x)\sin[g(x)]dx.$$

4 Use substitution to evaluate the definite integral

$$\int_0^{\pi/3} \frac{\sin x}{\cos^2 x}\,dx.$$

5 Use integration by parts to evaluate the indefinite integrals.

1. $\int 3x\cos x\,dx$
2. $\int 2x^2e^{-x}\,dx$

6 Use integration by parts to evaluate the definite integrals.

1. $\int_0^{\pi/4} 2x\cos x\,dx$
2. $\int_1^e \ln x^2\,dx$

7 Use an appropriate substitution followed by integration by parts to evaluate

$$\int x^3 e^{-x^2/2}\, dx.$$