Università Ca' Foscari di Venezia - Dipartimento di Economia - A.A.2016-2017

Mathematics (Economics, Markets and Finance)

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Exercises sheet 3

Exercise 1. *Find the following integrals:*

a) $\int 9\sqrt[3]{x}\,\mathrm{d}x$;

b) $\int \frac{2}{\sqrt[5]{x}}\,\mathrm{d}x$;

c) $\int \frac{x}{\sqrt[7]{x^3}}\,\mathrm{d}x$;

d) $\int 8x^2\sqrt[7]{x^5}\,\mathrm{d}x$;

e) $\int \frac{1}{x^2\sqrt[3]{x^2}}\,\mathrm{d}x$.

Exercise 2. *Find the following integrals:*

a) $\int \frac{1}{x-1}\,\mathrm{d}x$;

b) $\int \frac{1}{5+2x}\,\mathrm{d}x$;

c) $\int \frac{x}{1+x^2}\,\mathrm{d}x$;

d) $\int \frac{2x+1}{x^2+x+9}\,\mathrm{d}x$;

e) $\int \frac{x^2}{x^3+2}\,\mathrm{d}x$;

f) $\int \frac{x+1}{x^2+2x+5}\,\mathrm{d}x$.

g) $\int \frac{\mathrm{e}^x}{\mathrm{e}^x+1}\,\mathrm{d}x$.

Exercise 3. *Find the following integrals:*

a) $\int 2xe^{x^2}\,dx$;

b) $\int e^{-x}\,dx$;

c) $\int x^2e^{-x^3}\,dx$;

d) $\int (2x+3)e^{x^2+3x}\,dx$.

Exercise 4. *Find the following integrals:*

a) $\int \left(e^{2x}+x^3+\sqrt{x}\right)dx$;

b) $\int \frac{x^2+2}{x^3}\,dx$;

c) $\int \left(x^2+x\sqrt{x}+xe^{x^2}\right)dx$;

d) $\int \frac{x^2+1}{x\sqrt{x}}\,dx$

Exercise 5. *Find the following integrals:*

a) $\int \ln x\,dx$;

b) $\int xe^x\,dx$;

c) $\int xe^{-x}\,dx$;

d) $\int x^2e^x\,dx$.

Exercise 6. *Calculate the area between the given functions, the x axis and the two vertical lines given.*

a) $f(x)=e^x$, $x=0$, $x=2$.

b) $f(x)=x^2+1$, $x=1$, $x=3$.

c) $f(x)=\ln x$, $x=1$, $x=e$.

d) $f(x)=\sqrt{x}$, $x=1$, $x=4$.

Exercise 7. *Given the function*

$$f(x)=\begin{cases} x^2, & \text{if } x<1; \\ -x+2, & \text{if } x\geq 1; \end{cases},$$

calculate the area between the graph, the x axis and the vertical lines $x=0$ *and* $x=2$.

Exercise 8. *Calculate the area between the graphs of the following functions:*

a) $f(x) = x^2$ *and* $g(x) = x$*;*

b) $f(x) = x^2 - 1$ *and* $g(x) = -x^2 + x$*.*

Exercise 9. *Find the following improper integrals, if they converge.*

a) $\int_0^{+\infty} e^{-x}\,dx$*;*

b) $\int_1^{+\infty} \frac{1}{x^2}\,dx$*;*

c) $\int_{-\infty}^{1} e^{x}\,dx$*;*

d) $\int_0^{1} \frac{1}{\sqrt{x}}\,dx$*;*

e) $\int_0^{1} \frac{1}{x^2}\,dx$*;*

f) $\int_1^{+\infty} \frac{1}{x}\,dx$*.*