Summer Term I | MA124 Calculus II
Kostadinov | Boston University

Quiz No.8

student:

Problem 1: Evaluate the definite integral

$$\int_0^1 e^{3x}\,dx$$

Problem 2: Evaluate the indefinite integral

$$\int xe^x\,dx$$

Problem 3: Evaluate the indefinite integral

$$\int \frac{\sin(\ln(x))}{x}\,dx$$

Problem 4: Evaluate the definite integral

$$\int_0^1 x - x^2\,dx$$

Problem 5: Find the area of the region enclosed by the curves $y = x$ and $y = x^2$ from $x = 0$ to $x = 1$.

Problem 6: Evaluate the definite integral using the tables. Indicate the number of the formula used, as well as the numeric values of the parameters:

$$\int_0^{\pi/6} e^{2x} \cos 3x \, dx$$

Problem7: Evaluate the definite integral using the tables. Indicate the number of the formula used, as well as the numeric values of the parameters:

$$\int_{\pi/6}^{\pi/3} \sin(2y) \cos(y) \, dy$$

Problem8: Evaluate the definite integral using the tables. Indicate the number of the formula used, as well as the numeric values of the parameters:

$$\int \frac{u^2+3}{u^2\sqrt{u^2+1}} \, du =$$

Problem 9: Evaluate the improper integral
$\int_1^{\infty} \frac{1}{x^2} \, dx$

Problem 10: Use Fundamental theorem of Calculus to find the derivative of the function:
a) $F(x) = \int_0^x t^2 dt$
b) $F(x) = \int_0^{x^2} \tan(t) dt$

TABLE OF INTEGRALS

1: $\int \sqrt{a^2+u^2}\,du = \frac{u}{2}\sqrt{a^2+u^2} + \frac{a^2}{2}\ln(u+\sqrt{a^2+u^2}) + C$

2: $\int \frac{du}{\sqrt{u^2+a^2}} = \ln(u+\sqrt{a^2+u^2}) + C$

3: $\int \frac{du}{u^2\sqrt{u^2+a^2}} = -\frac{a^2+u^2}{a^2u} + C$

4: $\int \frac{\sqrt{a^2+u^2}}{u^2}\,du = -\frac{\sqrt{a^2+u^2}}{u} + \ln(u+\sqrt{a^2+u^2}) + C$

5: $\int \frac{du}{\sqrt{a^2+u^2}} = \ln(u+\sqrt{a^2+u^2}) + C$

6: $\int \frac{u^2\,du}{\sqrt{u^2-a^2}} = -\frac{u}{2}\sqrt{u^2-a^2} + \frac{a^2}{2}\ln|u+\sqrt{u^2-a^2}| + C$

7: $\int \frac{u^2\,du}{\sqrt{u-a^2}} = \frac{2}{15}(8a^4+3u^2+4a^2u)\sqrt{u-a^2} + C$

8: $\int \sin(au)\cos(bu)\,du = -\frac{\cos((a-b)u)}{2(a-b)} - \frac{\cos((a+b)u)}{2(a+b)} + C$

9: $\int \frac{u^2\,du}{\sqrt{a^2+u^2}} = \frac{u}{2}\sqrt{a^2+u^2} - \frac{a^2}{2}\ln(u+\sqrt{a^2+u^2}) + C$

10: $\int u\cos(u)\,du = cos(u) + u\sin(u) + C$

11: $\int e^{au}\cos bu\,du = \frac{e^{au}}{a^2+b^2}(a\cos(bu) + b\sin(bu)) + C$

12: $\int ue^{au}\,du = \frac{1}{a^2}(au-1)e^{au} + C$

13: $\int \frac{du}{u\sqrt{a^2+u^2}} = -\frac{1}{a}\ln(\frac{a+\sqrt{a^2+u^2}}{u}) + C$

Values of trigonometric functions, you may find useful:

$$\sin(0) = 0 \quad \sin\frac{\pi}{2} = 1 \quad \sin\pi = 0$$

$$\sin\frac{\pi}{3} = \frac{\sqrt{3}}{2} \quad \cos\frac{\pi}{6} = \frac{\sqrt{3}}{2} \quad \cos\frac{\pi}{3} = \frac{1}{2}$$