

Math 111 Problem Set 4

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Due: Thursday, October 20, 2005, at the beginning of tutorial

Please hand the following problems in. The last two are more difficult, as usual.

1. (2 marks) Evaluate the following indefinite integrals by integration by parts:

(a) $\int x \sin 7x \, dx$

(c) $\int \cos^{-1} x \, dx$

(b) $\int r e^{\pi r} \, dr$

(d) $\int e^{3\theta} \sin(2\theta) \, d\theta$

2. (2 marks) Evaluate the following indefinite trigonometric integrals:

(a) $\int \sin^2 x \cos^3 x \, dx$

(c) $\int \sin^4 \theta \cos^2 \theta \, d\theta$

(b) $\int \sin^5 x \cos^4 x \, dx$

(d) $\int \tan^2 t \sec^4 t \, dt$

3. (2 marks) Evaluate the following definite integrals by integration by parts:

(a) $\int_0^{\pi} t \cos 4t \, dt$

(c) $\int_1^4 (x^2 + 4)e^x \, dx$

(b) $\int_1^2 \frac{\ln x}{x^3} \, dx$

(d) $\int_0^8 t 2^t \, dt$

4. (2 marks) Evaluate the following integrals:

(a) $\int_{\sqrt{\pi/2}}^{\sqrt{\pi}} \cos \sqrt{x} \, dx$

(c) $\int \tan^3 \theta \sec^3 \theta \, d\theta$

(b) $\int_4^9 e^{\sqrt{x}} \, dx$

(d) $\int_{\pi/4}^{\pi/2} \cot^4 x \, dx$

5. (1 mark) Evaluate the following integrals:

(a) $\int \frac{dx}{1 - \sin x}$

(b) $\int_0^{\pi/4} \tan^4 \theta \sec \theta \, d\theta$

6. (1 mark) Suppose the function f is continuous and positive and has a continuous, positive first derivative f' on the domain $[a, b]$. Show that

$$\int_{f(a)}^{f(b)} f^{-1}(y) \, dy = bf(b) - af(a) - \int_a^b f(x) \, dx$$

which gives a formula for the integral of an inverse function.

Please do the following problems from the textbook. You do not need to hand in your solutions to these problems!

8.1 C-level: 1–16, 19–26, 33–36, 41–44, 49–52, 59–61; B-level: 27–32, 45–48, 62–63; A-level: 64, 66

8.2 C-level: 1–30, 33–34, 41–43, 47, 53–56, 63–67; B-level: 31–32, 35–40, 44–46, 48; A-level: 68