

# MATH 111 Problem Set 4

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Quiz: Thursday, October 26, 2006

The following problems may appear on the quiz on Thursday, October 26. The last two are more difficult, as usual.

1. 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. 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. 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. 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)  $\int_0^{\pi/4} \tan^4 x dx$

5. Evaluate the following integrals:

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

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

6. 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. They may appear on the midterm or final exam.

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