

MA124 Practice Problems

Summer II, 2011

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1. (a) Calculate

$$\int_0^1 \frac{x \, dx}{\sqrt{x^2 + 4}}$$

(b) Calculate

$$\int_0^{\pi/2} \tan^2 \frac{x}{2} \, dx$$

(c) If f is continuous and $\int_0^4 f(x) \, dx = 10$, find $\int_0^2 f(2x) \, dx$

2. Evaluate the indefinite integrals:

(a)

$$\int \frac{(\ln x)^2}{x} \, dx$$

(b)

$$\int \sin x e^x \, dx$$

(c)

$$\int \sin^2 x \cos^2 x \, dx$$

(d)

$$\int \sqrt{x^2 + 4} \, dx$$

(e)

$$\int \frac{dx}{x^2 \sqrt{x^2 - 4}}$$

3. For $F(x)$, find $F'(x)$

(a)

$$F(x) = \int_{2x}^{3x} \frac{u^2 - 1}{u^2 + 1} du$$

(b)

$$F(x) = \left(\int_a^x u^2 + 1 du \right)^2$$

where a is a constant.

4. Find the area of the region bounded above by the graph of $y = \frac{1}{x}$, below by the x -axis, and two vertical lines $x = 1$ and $x = 9$.

5. Evaluate the integral:

$$\int \frac{3x^4 + 9x^3 + 15x^2 + 10x + 4}{x(x^2 + 2x + 2)^2} dx$$

6. Evaluate the integrals if possible:

(a)

$$\int_1^{\infty} \frac{\ln x}{x} dx$$

(b)

$$\int_0^2 x^2 \ln x dx$$

(c)

$$\int_1^{\infty} e^{-x} \sin x dx$$

7. Show that:

$$2 \leq \int_{-1}^1 \sqrt{1+x^2} dx \leq 2\sqrt{2}$$