

MATH 221: Calculus and Analytic Geometry  
Prof. Ram, Fall 2006

HOMEWORK 9  
DUE November 6, 2006

Problem A. Indefinite integrals.

$$(1) \int x^7 dx$$

$$(2) \int x^{-7} dx$$

$$(3) \int x^{-1} dx$$

$$(4) \int x^{5/3} dx$$

$$(5) \int x^{-5/4} dx$$

$$(6) \int \sqrt[3]{x^2} dx$$

$$(7) \int \frac{1}{\sqrt[4]{x^3}} dx$$

$$(8) \int \frac{2}{x^2} dx$$

$$(9) \int (8 - x + 2x^3 - 6/x^3 + 2x^{-5} + 5x^{-1}) dx$$

$$(10) \int (2 - 5x)(3 + 2x)(1 - x) dx$$

$$(11) \int \sqrt{x}(ax^2 + bx + c) dx$$

$$(12) \int (x^2 - 1/x^2)^3 dx$$

$$(13) \int (\sqrt{x} - 1/\sqrt{x}) dx$$

$$(14) \int \left( \sqrt{x} + \frac{1}{\sqrt{x}} \right)^2 dx$$

$$(15) \int \frac{(1+2x)^3}{x^4} dx$$

$$(16) \int \frac{(1+x)^3}{\sqrt{x}} dx$$

$$(17) \int \frac{2x^2 + x - 2}{x - 2} dx$$

$$(18) \text{ If } \frac{df}{dx} = x - 1/x^2 \text{ and } f(1) = 1/2 \text{ find } f(x).$$

**Problem B. Indefinite integrals with trigonometric functions.**

$$(1) \int \left( 9 \sin x - 7 \cos x - \frac{6}{\cos^2 x} + \frac{2}{\sin^2 x} + \cot^2 x \right) dx$$

$$(2) \int \left( \frac{\cot x}{\sin x} - \tan^2 x - \frac{\tan x}{\cos x} + \frac{2}{\cos^2 x} \right) dx$$

$$(3) \int \sec x (\sec x + \tan x) dx$$

$$(4) \int \csc x (\csc x - \cot x) dx$$

$$(5) \int (\tan x + \cot x)^2 dx$$

$$(6) \int \frac{1 + 2 \sin x}{\cos^2 x} dx$$

$$(7) \int \frac{3 \cos x + 4}{\sin^2 x} dx$$

$$(8) \int \frac{1}{1 - \cos x} dx$$

$$(9) \int \frac{1}{1 + \cos x} dx$$

$$(10) \int \frac{\tan x}{\sec x + \tan x} dx$$

$$(11) \int \frac{\csc x}{\csc x - \cot x} dx$$

$$(12) \int \frac{\cos x}{1 + \cos x} dx$$

$$(13) \int \frac{\sin x}{1 - \sin x} dx$$

$$(14) \int \sqrt{1 + \cos 2x} dx$$

$$(15) \int \sqrt{1 - \cos 2x} dx$$

$$(16) \int \frac{1}{1 + \cos 2x} dx$$

$$(17) \int \frac{1}{1 - \cos 2x} dx$$

$$(18) \int \sqrt{1 + \sin 2x} dx$$

$$(19) \int \frac{\sin^3 x + \cos^3 x}{\sin^2 x \cos^2 x} dx$$

**Problem C. Integrals with exponential functions and inverse functions.**

$$(1) \int 2^x dx$$

$$(2) \int (6x^5 - 2x^{-4} - 7x + 3/x - 5 + 4e^x + 7^x) dx$$

$$(3) \int (x/a + a/x + x^a + a^x + ax) dx$$

$$(4) \int \left( \sqrt{x} - \sqrt[3]{x^4} + \frac{7}{\sqrt[3]{x^2}} - 6e^x + 1 \right) dx$$

$$(5) \int \frac{x^2 - 1}{x^2 + 1} dx$$

$$(6) \int \frac{x^6 - 1}{x^2 + 1} dx$$

$$(7) \int \frac{x^4}{1+x^2} dx$$

$$(8) \int \frac{x^2}{1+x^2} dx$$

$$(9) \int \left( 1 + \frac{1}{1+x^2} - \frac{2}{\sqrt{1-x^2}} + \frac{5}{x\sqrt{x^2-1}} + a^x \right) dx$$

$$(10) \int \tan^{-1} \left( \frac{\sin 2x}{1 + \cos 2x} \right) dx$$

$$(11) \int \cos^{-1} \left( \frac{1 - \tan^2 x}{1 + \tan^2 x} \right) dx$$

$$(12) \int \cos^{-1}(\sin x) dx$$

$$(13) \int \cot^{-1} \left( \frac{\sin 2x}{1 - \cos 2x} \right) dx$$

**Problem D. Integration by substitution.**

$$(1) \int (2x + 9)^5 dx$$

$$(2) \int (7 - 3x)^4 dx$$

$$(3) \int \sqrt{3x - 5} dx$$

$$(4) \int \frac{1}{\sqrt{4x + 3}} dx$$

$$(5) \int \frac{1}{\sqrt{3 - 4x}} dx$$

$$(6) \int \frac{1}{(2x - 3)^{3/2}} dx$$

$$(7) \int \frac{4x}{2x^2 + 3} dx$$

$$(8) \int \frac{x + 1}{x^2 + 2x - 3} dx$$

$$(9) \int \frac{4x - 5}{2x^2 - 5x + 1} dx$$

$$(10) \int \frac{9x^2 - 4x + 5}{3x^3 - 2x^2 + 5x + 1} dx$$

$$(11) \int \frac{2x + 3}{\sqrt{x^2 + 3x - 2}} dx$$

$$(12) \int \frac{2x - 1}{\sqrt{x^2 - x - 1}} dx$$

$$(13) \int \frac{dx}{\sqrt{x + a} + \sqrt{x + b}}$$

$$(14) \int \frac{dx}{\sqrt{1 - 3x} - \sqrt{5 - 3x}}$$

$$(15) \int \frac{x^2}{1 + x^6} dx$$

$$(16) \int \frac{x^3}{1 + x^8} dx$$

$$(17) \int \frac{x}{1 + x^4} dx$$

$$(18) \int \frac{x^5}{\sqrt{1 + x^3}} dx$$

$$(19) \int \frac{x}{\sqrt{1 + x}} dx$$

$$(20) \int \frac{1}{x\sqrt{x^4 - 1}} dx$$

$$(21) \int x\sqrt{x - 1} dx$$

$$(22) \int (1 - x)\sqrt{1 + x} dx$$

$$(23) \int x\sqrt{x^2 - 1} dx$$

$$(24) \int x\sqrt{3x-2} \, dx$$

$$(25) \int (2x-3)\sqrt{x^2-3x+5} \, dx$$

$$(26) \int \frac{dx}{3-5x}$$

$$(27) \int \sqrt{1+x} \, dx$$

**Problem E. Integrals with trigonometric functions.**

$$(1) \int \sin 3x \, dx$$

$$(2) \int \cos(5+6x) \, dx$$

$$(3) \int \sin(5-3x) \, dx$$

$$(4) \int \csc^2(2x+5) \, dx$$

$$(5) \int \sin x \cos x \, dx$$

$$(6) \int \sin^3 x \cos x \, dx$$

$$(7) \int \sqrt{\cos x} \sin x \, dx$$

$$(8) \int \frac{\cos \sqrt{x}}{\sqrt{x}} \, dx$$

$$(9) \int \sin(ax+b) \cos(ax+b) \, dx$$

$$(10) \int \cos^3 x \, dx$$

$$(11) \int (1/x^2) \cos(1/x) \, dx$$

$$(12) \int 2x \sin(x^2 + 1) dx$$

$$(13) \int \frac{\tan \sqrt{x} \sec^2 \sqrt{x}}{\sqrt{x}} dx$$

$$(14) \int \frac{\sec^2 x}{1 + \tan x} dx$$

$$(15) \int \frac{\sin x}{1 + \cos x} dx$$

$$(16) \int \frac{\sin x}{2 + 3 \cos x} dx$$

$$(17) \int \frac{\sin 2x}{a^2 + b^2 \sin^2 x} dx$$

$$(18) \int \frac{\sin 2x}{a^2 \cos^2 x + b^2 \sin^2 x} dx$$

$$(19) \int \frac{2 \cos x - 3 \sin x}{3 \cos x + 2 \sin x} dx$$

$$(20) \int \frac{1 + \cos x}{(x + \sin x)^3} dx$$

$$(21) \int \frac{\sin x}{(1 + \cos x)^2} dx$$

$$(22) \int x^2 \sin x^3 dx$$

$$(23) \int \frac{\sin x}{\sin x - \cos x} dx$$

$$(24) \int \frac{dx}{1 - \tan x}$$

$$(25) \int \frac{dx}{1 - \cot x}$$

$$(26) \int \frac{\cos 2x}{(\sin x + \cos x)^2}$$

$$(27) \int \frac{\cos x - \sin x}{(1 + \sin 2x)}$$

$$(28) \int x \sin^3 x^2 \cos x^2 dx$$

$$(29) \int \frac{\sec^2 x}{\sqrt{1 - \tan^2 x}} dx$$

$$(30) \int 2x \sec^3(x^2 + 3) \tan(x^2 + 3) dx$$

$$(31) \int \frac{\sin 2x}{(a + b \cos 2x)^2} dx$$