

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

HOMEWORK 9: SELECTED ANSWERS

Problem A. Indefinite integrals.

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| (1) $\frac{x^8}{8} + c$ | (2) $-\frac{1}{6x^6} + c$ |
| (3) $\ln x + c$ | (4) $\frac{3}{8}x^{8/3} + c$ |
| (5) $-4x^{-1/4} + c$ | (6) $\frac{3}{5}x^{5/3} + c$ |
| (7) $4x^{1/4} + c$ | (8) $\frac{-2}{x} + c$ |
| (9) $8x - \frac{x^2}{2} + \frac{x^4}{2} + \frac{3}{x^2} - \frac{1}{2x^4} + 5 \ln x + c$ | |
| (10) $6x - \frac{17x^2}{2} + \frac{x^3}{3} + \frac{5x^4}{2} + c$ | |
| (11) $\frac{2ax^{7/2}}{7} + \frac{2bx^{5/2}}{5} + \frac{2cx^{3/2}}{3} + c$ | |
| (12) $\frac{x^7}{7} + \frac{1}{5x^5} - x^3 - \frac{3}{x} + c$ | |
| (13) $\frac{2x^{3/2}}{3} - 2x^{1/2} + c$ | (14) $\frac{x^2}{2} + \ln x + 2x + c$ |
| (15) $-\frac{1}{3x^3} + 8 \ln x - \frac{3}{x^2} - \frac{12}{x} + c$ | |
| (16) $2\sqrt{x} + \frac{2}{7}x^{7/2} + 2x^{3/2} + \frac{6}{5}x^{5/2} + c$ | |
| (17) $x^2 + 5x + 8 \ln x - 2 + c$ | (18) $f(x) = x^2/2 + 1/x - 1$ |

Problem B. Indefinite integrals with trigonometric functions.

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| (1) $-9 \cos x - 7 \sin x - 6 \tan x - 3 \cot x - x + c$ | |
| (2) $-\csc x + \tan x + x - \sec x + c$ | (3) $\tan x + \sec x + c$ |
| (4) $-\cot x + \csc x + c$ | (5) $\tan x - \cot x + c$ |

$$(6) \quad \tan x + 2 \sec x + c$$

$$(7) \quad -3 \csc x - 4 \cot x + c$$

$$(8) \quad -\cot x - \csc x + c$$

$$(9) \quad -\cot x + \csc x + c$$

$$(10) \quad \sec x - \tan x + x + c$$

$$(11) \quad -\cot x - \csc x + c$$

$$(12) \quad -\csc x + \cot x + x + c$$

$$(13) \quad \sec x + \tan x - x + c$$

$$(14) \quad \sqrt{2} \sin x + c$$

$$(15) \quad -\sqrt{2} \cos x + c$$

$$(16) \quad (1/2) \tan x + c$$

$$(17) \quad (-1/2) \cot x + c$$

$$(18) \quad \sin x - \cos x + c$$

$$(19) \quad \sec x - \csc x + c$$

Problem C. Integrals with exponential functions and inverse functions.

$$(1) \quad \frac{2^x}{\ln 2} + c \quad (2) \quad x^6 + \frac{2}{3x^3} - \frac{7x^2}{2} + 3 \ln |x| - 5x + 4e^x + \frac{7^x}{\ln 7} + c$$

$$(3) \quad \frac{x^2}{2a} + a \ln |x| + \frac{x^{a+1}}{a+1} + \frac{a^x}{\ln a} + ax^2/2 + c$$

$$(4) \quad \frac{2}{3}x^{3/2} - \frac{3}{7}x^{7/3} + 21x^{1/3} - 6e^x + x + c$$

$$(5) \quad x - 2 \tan^{-1} x + c$$

$$(6) \quad x^5/5 - x^3/3 + x - 2 \tan^{-1} x + c$$

$$(7) \quad x^3/3 - x + \tan^{-1} x + c$$

$$(8) \quad x - \tan^{-1} x + c$$

$$(9) \quad x + \tan^{-1} x - 2 \sin^{-1} x + 5 \sec^{-1} x + \frac{a^x}{\ln a} + c$$

$$(10) \quad x^2/2 + c$$

$$(11) \quad x^2 + c$$

$$(12) \quad \pi x/2 - x^2/2 + c$$

$$(13) \quad x^2/2 + c$$

Problem D. Integration by substitution.

$$(1) \quad \frac{(2x+9)^6}{12} + c$$

$$(2) \quad -\frac{(7-3x)^5}{15} + c$$

$$(3) \quad (2/9)(3x-5)^{3/2} + c$$

$$(4) \quad (1/2)\sqrt{4x+3} + c$$

$$(5) \quad -(1/2)\sqrt{3-4x} + c$$

$$(6) \quad \frac{-1}{\sqrt{2x-3}} + c$$

- (7) $\ln |2x^2 + 3| + c$ (8) $(1/2) \ln |x^2 + 2x - 3| + c$
 (9) $\ln |2x^2 - 5x + 1| + c$ (10) $\ln |3x^3 - 2x^2 + 5x + 1| + c$
 (11) $2\sqrt{x^2 + 3x - 2} + c$ (12) $2\sqrt{x^2 - x - 1} + c$
 (13) $\frac{2}{3(a-b)} \left((x+a)^{3/2} - (x+b)^{3/2} \right) + c$
 (14) $\frac{1}{18} \left((1-3x)^{3/2} + (5-3x)^{3/2} \right) + c$ (15) $(1/3) \tan^{-1} x^3 + c$
 (16) $(1/4) \tan^{-1} x^4 + c$ (17) $(1/2) \tan^{-1} x^2 + c$
 (18) $(2/9)(1+x^3)^{3/2} - (2/3)(1+x^3)^{1/2} + c$
 (19) $(2/3)(1+x)^{3/2} - 2\sqrt{1+x} + c$ (20) $(1/2) \sec^{-1} x^2 + c$
 (21) $(2/5)(x-1)^{5/2} + (2/3)(x-1)^{3/2} + c$
 (22) $(4/3)(1+x)^{3/2} - (2/5)(1+x)^{5/2} + c$
 (23) $(1/3)(x^2-1)^{3/2} + c$
 (24) $(2/45)(3x-2)^{5/2} + (4/27)(3x-2)^{3/2} + c$
 (25) $(2/3)(x^2-3x+5)^{3/2} + c$ (26) $\frac{-\ln |3-5x|}{5} + c$
 (27) $(2/3)(1+x)^{3/2} + c$

Problem E. Integrals with trigonometric functions.

- (1) $\frac{-\cos 3x}{3} + c$ (2) $(1/6) \sin(5+6x) + c$
 (3) $(1/3) \cos(5-3x) + c$ (4) $(-1/2) \cot(2x+5) + c$
 (5) $(1/2) \sin^2 x + c$ (6) $(1/4) \sin^4 x + c$
 (7) $(-2/3)(\cos x)^{3/2} + c$ (8) $2 \sin \sqrt{x} + c$
 (9) $\frac{\sin^2(ax+b)}{2a} + c$ (10) $\frac{\sin 3x}{12} + (3/4) \sin x + c$
 (11) $-\sin(1/x) + c$ (12) $-\cos(x^2+1) + c$

$$(13) \quad \tan^2 \sqrt{x} + c$$

$$(14) \quad \ln |1 + \tan x| + c$$

$$(15) \quad -\ln |1 + \cos x| + c$$

$$(16) \quad -(1/3) \ln |2 + 3 \cos x| + c$$

$$(17) \quad (1/b^2) \ln |a^2 + b^2 \sin^2 x| + c$$

$$(18) \quad \frac{1}{b^2 - a^2} \ln |a^2 \cos^2 x + b^2 \sin^2 x| + c$$

$$(19) \quad \ln |3 \cos x + 2 \sin x| + c$$

$$(20) \quad \frac{-1}{2(x + \sin x)^2} + c$$

$$(21) \quad \frac{1}{(1 + \cos x)} + c$$

$$(22) \quad (-1/3) \cos x^3 + c$$

$$(23) \quad (1/2)x + (1/2) \ln |\sin x - \cos x| + c$$

$$(24) \quad (1/2)x - (1/2) \ln |\sin x - \cos x| + c$$

$$(25) \quad (1/2)x + (1/2) \ln |\sin x - \cos x| + c$$

$$(26) \quad \ln |\sin x + \cos x| + c$$

$$(27) \quad \frac{-1}{\sin x + \cos x} + c$$

$$(28) \quad (1/8) \sin^4 x^2 + c$$

$$(29) \quad \sin^{-1}(\tan x) + c$$

$$(30) \quad \frac{\sec^3(x^2 + 3)}{3} + c$$

$$(31) \quad \frac{1}{2b(a + b \cos 2x)} + c$$