

201-203-RE - Practice Set #10: Mixed Integrals

Evaluate the following integrals. Problems with * are optional.

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|---------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------|
| (1) $\int \frac{3x^2 + 4x + 3}{(x+2)^2(x-5)} dx$ | (22) $\int_0^1 (t^2 + 1)e^{t^3+3t} dt$ | (42) $\int \frac{2x}{(2x+1)^{3/2}} dx$ |
| (2) $\int_{-2}^3 2x+1 dx$ | (23) $\int \frac{x^4 + 4x^3 - 4x^2 + 1}{x^3 - x^2} dx$ | (43)* $\int \sin(2x) \cos(3x) dx$ |
| (3) $\int (x+1)e^x \sqrt{xe^x} dx$ | (24) $\int_{-2}^0 \frac{x+2}{\sqrt{x^2+4x+9}} dx$ | (44) $\int (3x+2)^2 \cos(5x) dx$ |
| (4) $\int \frac{x^4 + 5x^3 + 7x^2 + 2x + 1}{x^2 + 5x + 6} dx$ | (25) $\int_{-\pi/4}^{\pi/2} \sin^3(2x) dx$ | (45) $\int_0^{\sqrt{\pi/4}} x \sec^2(x^2) dx$ |
| (5) $\int \frac{3x^2 + 3x + 1}{x(x+1)^2} dx$ | (26) $\int_{-\frac{1}{2}}^0 \frac{e^{-2x}}{\sqrt{3e^{-2x}+1}} dx$ | (46) $\int \frac{e^x}{e^{2x}-1} dx$ |
| (6) $\int 3x^5 e^{x^3} dx$ | (27) $\int_{-2}^1 (2 - x+1) dx$ | (47) $\int \frac{x^3 + 3x^2 - 4x - 8}{(x+1)(x+2)^3} dx$ |
| (7) $\int_1^e \frac{\ln x}{x} dx$ | (28) $\int 2x \ln(3x) dx$ | (48) $\int_{-3}^0 \frac{x}{(x+4)^{3/2}} dx$ |
| (8) $\int (2x^2 + 1)e^{4x^3+6x} dx$ | (29) $\int \frac{4x}{(x^2-1)(x+1)} dx$ | (49) $\int \frac{\sin x \cos x}{\sqrt[3]{\sin^2 x + 7}} dx$ |
| (9) $\int \frac{\cos \sqrt{x}}{\sqrt{x}} dx$ | (30) $\int (\cos x + 5^x + \sqrt{4x} - e^5) dx$ | (50) $\int \frac{u+2}{2u+1} du$ |
| (10) $\int x \ln(2x-1) dx$ | (31) $\int \frac{x(2-\sqrt{x}) + x^2 \sec x}{x^2} dx$ | (51) $\int_{-1}^2 \frac{7x}{\sqrt{x+2}} dx$ |
| (11) $\int \frac{3\sqrt{t} - 3 + t \cos(2t)}{2t} dt$ | (32) $\int_{\frac{1}{3}}^1 (1-6x) \ln x dx$ | (52) $\int 3x^2 \sin x dx$ |
| (12) $\int \frac{5x^3 \sin x + \sqrt{x} - 10}{x^3} dx$ | (33) $\int_0^{\pi/4} \sec^2 x \sqrt{2 - \tan x} dx$ | (53) $\int \frac{\cot(2x) - 4x \cos(2x) + 3 \sec(2x)}{\cos(2x)} dx$ |
| (13) $\int_0^8 \frac{e^{\sqrt{x+1}}}{\sqrt{x+1}} dx$ | (34) $\int_0^{\pi/4} \frac{\sec^2 x}{\tan x + 1} dx$ | (54) $\int \frac{x^4 + x^3 + x^2 + 3}{x^2 + x - 2} dx$ |
| (14) $\int 2 \sin x \cos x \ln(\sin x) dx$ | (35) $\int \sin(\ln x) dx$ | (55) $\int_1^{e^2} \frac{(\ln x + 1)^2}{3x} dx$ |
| (15) $\int x^9 \cos(x^5) dx$ | (36) $\int_0^{\pi/4} \sin(2x) \sqrt[3]{2 + \cos(2x)} dx$ | (56) $\int \frac{(1 + \sqrt{x})^5}{\sqrt{x}} dx$ |
| (16) $\int (x^3 + 2) \sin(x^4 + 8x) dx$ | (37) $\int_{\frac{\pi}{2}}^e \frac{dx}{x \ln(2x)}$ | (57)* $\int e^{2x} \sin x dx$ |
| (17) $\int \frac{9x+7}{(x-2)(x+3)^2} dx$ | (38) $\int \frac{3\sqrt[4]{x} + 6\sqrt[3]{x^5} - 4x^2}{2\sqrt{x}} dx$ | (58) $\int x^{2x} dx$ |
| (18) $\int_{-2}^1 x+1 dx$ | (39) $\int (3x^2 - 1)e^{4x} dx$ | (59) $\int \frac{\tan(3x)}{\cos^2(3x)} dx$ |
| (19) $\int \frac{\sec x \tan x - \cos x}{\cos x \tan x} dx$ | (40) $\int \frac{\csc^2 x}{\cot x + 1} dx$ | (60) $\int e^{\sqrt{x}} dx$ |
| (20) $\int 2 \sin(\sqrt{x}) dx$ | (41) $\int \frac{x^6 - 9x^4 + 7x - 6}{x^2 - 3x} dx$ | (61) $\int \cos x \ln(2 \sin x) dx$ |

ANSWERS:

- (1) $\frac{1}{x+2} + 2 \ln|x-5| + \ln|x+2| + C$
(2) $29/2$
(3) $\frac{2}{3}(xe^x)^{3/2} + C$
(4) $\frac{x^3}{3} + x + \ln|x+2| - 4 \ln|x+3| + C$
(5) $\frac{1}{x+1} + \ln|x| + 2 \ln|x+1| + C$
(6) $e^{x^3}(x^3 - 1) + C$
(7) $1/2$
(8) $\frac{1}{6}e^{4x^3+6x} + C$
(9) $2 \sin \sqrt{x} + C$
(10) $\frac{1}{2}x^2 \ln(2x-1) - \frac{1}{2} \ln(2x-1) + C$
(11) $3\sqrt{t} - \frac{3}{2} \ln|t| + \frac{1}{2} \sin t \cos t + C$
(12) $-\frac{2}{3x^{3/2}} + \frac{5}{x^2} - 5 \cos(x) + C$
(13) $2e(e^2 - 1)$
(14) $\sin^2 x \ln(\sin x) - \frac{1}{2} \sin^2 x + C$
(15) $\frac{1}{5}x^5 \sin(x^5) + \frac{\cos(x^5)}{5} + C$
(16) $\frac{1}{4} \cos(x^4 + 8x) + C$
(17) $-\frac{4}{x+3} + \ln|2-x| - \ln|x+3| + C$
(18) $5/2$
(19) $\tan(x) - \ln|\sin x| + C$
(20) $4 \sin \sqrt{x} - 4\sqrt{x} \cos \sqrt{x} + C$
(21) $\frac{1}{2}(x-1)^2 + x + \ln|x-1| + C$
(22) $\frac{1}{3}(e^4 - 1)$
(23) $\frac{x^2}{2} + 5x + \frac{1}{x} + 2 \ln|1-x| - \ln|x| + C$
(24) $3 - \sqrt{5}$
(25) $1/3$
(26) $\frac{1}{3}(\sqrt{1+3e} - 2)$
(27) $7/2$
(28) $x^2 \ln(3x) - \frac{1}{2}x^2 + C$
(29) $-\frac{2}{x+1} + \ln|1-x| - \ln|x+1| + C$
(30) $\frac{4}{3}x^{3/2} - e^5x + \frac{1}{\ln 5}5^x + \sin x + C$
(31) $2 \ln|x| - 2\sqrt{x} + \ln|\sec x + \tan x| + C$
(32) $2/3$
(33) $\frac{2}{3}(2\sqrt{2} - 1)$
(34) $\ln 2$
(35) $\frac{1}{2}x \sin(\ln x) - \frac{1}{2}x \cos(\ln x) + C$
(36) $\frac{3}{8}(-2^{4/3} + 3^{4/3})$
(37) $\ln(1 + \ln 2)$
(38) $-\frac{4}{5}x^{5/2} + 2x^{3/2} + \frac{18}{13}x^{13/6} + C$
(39) $\frac{1}{32}e^{4x}(24x^2 - 12x - 5) + C$
(40) $-\ln|\cot x + 1| + C$
(41) $\frac{x^5}{5} + \frac{3x^4}{4} + 5 \ln|3-x| + 2 \ln|x| + C$
(42) $\frac{2(x+1)}{\sqrt{2x+1}} + C$
(43) $\frac{3}{13} \sin(2x) \sin(3x) + \frac{2}{13} \cos(2x) \cos(3x) + C$
(44) $\frac{1}{5}(3x+2)^2 \sin 5x + \frac{6}{25}(3x+2) \cos 5x - \frac{18}{125} \sin 5x + C$
(45) $1/2$
(46) $\frac{1}{2} \ln|1-e^x| - \frac{1}{2} \ln(e^x+1) + C$
(47) $\frac{2}{(x+2)^2} - 2 \ln|x+1| + 3 \ln|x+2| + C$
(48) -2
(49) $\frac{3}{4}(\sin^2(x) + 7)^{2/3} + C$
(50) $\frac{1}{2}u + \frac{3}{4} \ln|2u+1| + \frac{1}{4} + C$
(51) $14/3$
(52) $-3x^2 \cos x + 6x \sin x + 6 \cos x + C$
(53) $-\frac{1}{2} \ln|\csc x + \cot x| - 2x^2 + \frac{3}{2} \tan(2x) + C$
(54) $\frac{1}{3}x^3 + 3x + 2 \ln|1-x| - 5 \ln|x+2| + C$
(55) $26/9$
(56) $\frac{1}{3}(1 + \sqrt{x})^6 + C$
(57) $-\frac{1}{5}e^{2x} \cos x + \frac{2}{5}e^{2x} \sin x + C$
(58) $\frac{1}{\ln 2}x2^x - \frac{1}{(\ln 2)^2}2^x + C$
(59) $\frac{1}{6} \sec^2(3x) + C$
(60) $2e^{\sqrt{x}}(\sqrt{x} - 1) + C$
(61) $\sin x \ln(2 \sin x) - \sin x + C$