

# DEPARTMENT OF MATHEMATICS

## Integral Practice problems

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Review the following problems:

1.  $\int x \cos x \, dx$
2.  $\int x^2 \cos x \, dx$
3.  $\int x^2 e^x \, dx$
4.  $\int e^x \cos x \, dx$
5.  $\int \ln x \, dx$
6.  $\int x \ln x \, dx$
7.  $\int \tan^{-1} x \, dx$
8.  $\int x^2 \ln x \, dx$
9.  $\int x \ln(x+1) \, dx$
10.  $\int e^{\sqrt{x}} \, dx$
11.  $\int \cos^{-1} x \, dx$
12.  $\int x \ln \sqrt{x} \, dx$
13.  $\int \ln(2x) \, dx$
14.  $\int t \sin 2t \, dt$
15.  $\int x^5 \ln(5x) \, dx$
16.  $\int \frac{\ln x}{x^2} \, dx$
17.  $\int x \ln x^3 \, dx$
18.  $\int (x^{2/3} + \ln x - 7 \sin x) \, dx$
19.  $\int 5xe^{5x} \, dx$
20.  $\int \frac{2x-9}{x^2-6x+9} \, dx$
21.  $\int \frac{1}{\sqrt{x-9}} \, dx$
22.  $\int \frac{5x^2+3x+8}{(x^2+1)(x+1)} \, dx$
23.  $\int \sin x \sqrt{3+2\cos x} \, dx$
24.  $\int 3x^2 e^{x^3} \, dx$
25.  $\int \frac{2x^2-9}{\sqrt{x^3}} \, dx$
26.  $\int \frac{e^{1/t}}{2t^2} \, dt$
27.  $\int |2x| \, dx$
28.  $\int \frac{e^x}{e^x+2} \, dx$
29.  $\int \frac{e^x}{\ln 5 + e^x} \, dx$
30.  $\int \frac{2e^x+4x}{e^x+x^2} \, dx$
31.  $\int \frac{y-1}{\sqrt{y+1}} \, dy$
32.  $\int \cos(2x) \cos(\sin(2x)) \, dx$
33.  $\int x\sqrt{x-1} \, dx$
- 34a.  $\int \sqrt{\tan(x)} \sec^2(x) \, dx$
- 34b.  $\int \frac{u}{\sqrt{1-u^2}} \, dx$
35.  $\int \frac{2x}{1+x^4} \, dx$
36.  $\int \frac{\sin(\ln x)}{x} \, dx$
37.  $\int \frac{\cos(2x-9)}{1+\sin(2x-9)} \, dx$
38.  $\int \frac{1+e^{2t}}{e^t} \, dx$
39.  $\int \frac{2x-9}{x^2-6x+9} \, dx$
40.  $\int \frac{x^2}{1+x} \, dx$
41.  $\int \frac{e^{\ln x}}{x^2-6x} \, dx$
42.  $\int_0^{\pi/4} \sqrt{\tan(x)} \sec^2(x) \, dx$
43.  $\int_1^4 \frac{\ln(4x)}{x} \, dx$
44.  $\int_{-2}^{-1} |x| \, dx$
45.  $\int_1^1 e^{-x^2} \, dx$
46.  $\int_{-2}^2 \sin(x^3) \, dx$
47.  $\int_1^{16} e^{\sqrt{x}} \, dx$
48.  $\int_0^{1/2} \arccos(x) \, dx$
49.  $\int_0^{\pi/2} \cos^5 x \sin^4 x \, dx$
50.  $\int_1^3 \frac{\arctan \sqrt{t}}{\sqrt{t}} \, dt$

**Answer key for Mastery test: You need to add a constant with each answer.**

1.  $\cos x + x \sin x$       2.  $x^2 \sin x - 2 \sin x + 2x \cos x$       3.  $e^x(2 - 2x + x^2)$   
4.  $1/2 e^x(\cos x + \sin x)$       5.  $x(\ln x - 1)$       6.  $1/4 x^2(2 \ln x - 1)$   
7.  $x \tan^{-1} x - 1/2 \ln(1 + x^2)$       8.  $1/9 x^3(3 \ln x - 1)$   
9.  $1/2(x^2 - 1)\ln(x + 1) - 1/4 x^2 + 1/2 x$   
10.  $2e^{\sqrt{x}}(\sqrt{x} - 1)$       11.  $x \cos^{-1} x - \sqrt{1 - x^2}$       12.  $1/8 x^2(2 \ln x - 1)$   
13.  $x(\ln 2x - 1)$       14.  $1/4 \sin 2x - 1/2 x \cos 2x$       15.  $1/36 x^6(6 \ln 5x - 1)$   
16.  $-1/x(\ln x + 1)$       17.  $3/4 x^2(2 \ln x - 1)$       18.  $3/5 x^{5/3} + x \ln x - x + 7 \cos x$   
19.  $1/5 e^{5x}(5x - 1)$       20.  $2 \ln(x - 3) + 3/(x - 3)$       21.  $2\sqrt{x - 9}$   
22.  $3 \tan^{-1} x + 5 \ln(x + 1)$       23.  $-1/3(3 + 2 \cos x)^{3/2}$       24.  $e^{x^3}$   
25.  $4/3 x^{3/2} + 18x^{-1/2}$       26.  $-1/2 e^{1/t}$       27.  $-x^2, x < 0; x^2, x \geq 0$   
28.  $\ln(e^x + 2)$       29.  $\ln(\ln 5 + e^x)$       30.  $2 \ln(e^x + x^2)$   
31.  $2/3(y + 1)^{3/2} - 4\sqrt{y + 1}$       32.  $1/2 \sin(\sin 2x)$       33.  $2/5(x - 1)^{5/2} + 2/3(x - 1)^{3/2}$   
34a.  $2/3(\tan)^{3/2}$       34b.  $-\sqrt{1 - u^2}$       35.  $\tan^{-1}(x^2)$   
36.  $-\cos(\ln x)$       37.  $1/2 \ln(1 + \sin(2x - 9))$       38.  $-e^{-x} + e^x$   
39.  $3/(x - 3) + 2 \ln(x - 3)$       40.  $x^2/2 - x + \ln(1 + x)$       41.  $\ln(x - 6)$   
42.  $2/3$       43.  $2.88$       44.  $3/2$   
45.  $0$       46.  $0$       47.  $6e^4 \approx 327.59$  (you may substitute  $x = u^2$  and then apply integration by parts to find the integral)      48.  $0.6576$   
49.  $8/315$       50.  $-\pi/2 - \ln(2) + 2\pi\sqrt{3}/3 \approx 1.36$
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