

Techniques of Integration: math test, College – download the PDF

Suggested time: 45 minutes. Out of 20 points. Calculator allowed only when the problem says so.

1 Integration by parts

/ 4 pts

(a) Find $\int x^2 \ln x \, dx$. (b) Evaluate $\int_0^\pi x \sin x \, dx$.

2 Trigonometric integrals

/ 3 pts

(a) Find $\int \cos^2 x \, dx$. (b) Find $\int \sin^2 x \cos^3 x \, dx$.

3 Trigonometric substitution

/ 4 pts

(a) Find $\int \frac{dx}{x^2 \sqrt{4-x^2}}$ for $0 < x < 2$. (b) Evaluate $\int_0^3 \frac{dx}{x^2 + 9}$.

4 Partial fractions

/ 4 pts

Let $f(x) = \frac{x+5}{x^2-x-6}$. (a) Decompose f . (b) Find an antiderivative. (c) Evaluate $\int_4^6 f(x) \, dx$ to three decimals (calculator allowed).

5 Improper integrals

/ 3 pts

(a) Evaluate $\int_1^{\infty} \frac{\ln x}{x^2} dx$. (b) Evaluate $\int_0^1 x^{-1/3} dx$.

6 Numerical integration

/ 2 pts

Use the trapezoid rule with $n = 4$ to approximate $\int_0^2 x^2 dx$ and find the error compared with the exact value.



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