



Inspiring Excellence

Department of Mathematics and Natural Sciences

MAT 120

Midterm

SPRING 2022

Substitution methods(AQD)

1. Evaluate the integral using proper substitution (show each step): $\int \frac{x^2}{16 - x^2} dx$.
2. Evaluate the integral using proper substitution (show each step): $\int \frac{dx}{(4 + x^2)^2}$.
3. Evaluate the integral using proper substitution (show each step): $\int \frac{\sqrt{x^2 - 9}}{x} dx$.
4. Evaluate the integral using proper substitution (show each step): $\int \frac{3x^3}{\sqrt{1 - x^2}} dx$.
5. Evaluate the integral using proper substitution (show each step): $\int \frac{dx}{x^2 \sqrt{9x^2 - 4}}$.
6. Evaluate the integral using proper substitution (show each step): $\int \frac{dx}{(1 - x^2)^{3/2}}$.
7. Evaluate the integral using proper substitution (show each step): $\int \frac{dx}{\sqrt{x^2 - 9}}$.
8. Evaluate the integral using proper substitution (show each step): $\int e^x \sqrt{1 - e^{2x}} dx$.
9. Evaluate the integral using proper substitution (show each step): $\int 5x^3 \sqrt{1 - x^2} dx$.
10. Evaluate the integral using proper substitution (show each step): $\int \frac{dx}{x^2 \sqrt{x^2 - 1}}$.
11. Evaluate the integral using proper substitution (show each step): $\int \frac{\sqrt{x^2 - 1}}{x^4} dx$.

12. Evaluate the integral using proper substitution (show each step): $\int \frac{\sqrt{x^2 - 9}}{x^3} dx.$
13. Evaluate the integral using proper substitution (show each step): $\int \frac{\sqrt{4x^2 - 25}}{x} dx.$
14. Evaluate the integral using proper substitution (show each step): $\int \frac{\sqrt{1 + x^2}}{x} dx.$
15. Evaluate the integral using proper substitution (show each step): $\int \frac{dx}{x^2 \sqrt{x^2 + 4}} dx.$



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Integration by parts (HNA)

1. Evaluate: $\int_{-1}^2 x e^{6x} dx.$
2. Evaluate: $\int (3t + 5) \cos\left(\frac{t}{4}\right) dt.$
3. Evaluate: $\int x \sqrt{x+1} dx.$
4. Evaluate: $\int_1^2 x \ln x dx.$
5. Evaluate: $\int_0^5 x e^{-x} dx.$
6. Evaluate: $\int x \sec^2 x dx.$
7. Evaluate: $\int_0^1 x e^x dx.$
8. Evaluate: $\int_1^e x^3 \ln x dx.$
9. Evaluate: $\int_1^e x^2 \ln x dx.$
10. Evaluate: $\int x^{-3} \ln x dx.$
11. Evaluate: $\int_1^e u^2 \ln u du.$

12. Evaluate: $\int_{-1}^1 \ln(x+2) \, dx.$

13. Evaluate: $\int_{-1}^2 t e^{6t} \, dt.$

14. Evaluate: $\int (3x+5) \cos\left(\frac{x}{4}\right) \, dx.$

15. Evaluate: $\int_1^e u^3 \ln u \, du.$

0.0.1 Answers:

1. $\frac{1}{36}(11e^{12} + \frac{7}{e^6}).$

2. $4(3t+5) \sin\left(\frac{t}{4}\right) + 48 \cos\left(\frac{t}{4}\right) + C.$

3. $\frac{2x}{3}(x+1)^{\frac{3}{2}} + \frac{4}{15}(x+1)^{\frac{5}{2}} + C.$

4. $\ln 4 - \frac{3}{4}.$

5. $1 - 6e^{-5}.$

6. $x \tan x + \ln \cos x + C.$

7. 1.

8. $\frac{3}{16}e^4 + \frac{1}{16}.$

9. $\frac{1}{9}(2e^3 + 1).$

10. $\frac{-\ln x}{2x^2} - \frac{1}{4x^2} + C.$

11. $\frac{1}{9}(2e^3 + 1).$

12. $3 \ln 3 - 2.$

13. $\frac{1}{36}(11e^{12} + \frac{7}{e^6}).$

14. $4(3x+5) \sin\left(\frac{x}{4}\right) + 48 \cos\left(\frac{x}{4}\right) + C.$

15. $\frac{3}{16}e^4 + \frac{1}{16}.$