

Name & I.D. _____

Submission instructions: The assignment should be done individually. Make sure that student name and I.D. are listed on the submission. If you receive help from someone outside your study group, excluding the course staff, you must also acknowledge them on your assignment.

Exercises:

Prove the following reduction formulas

1. If $I_n = \int (\ln x)^n dx$, then $I_n = x(\ln x)^n - nI_{n-1}$
2. If $I_n = \int x^n e^x dx$, then $I_n = x^n e^x - nI_{n-1}$
3. If $I_n = \int \sin^n x dx$, then $I_n = -\frac{1}{n} \sin^{n-1} x \cos x + \frac{n-1}{n} I_{n-2}$
4. If $I_n = \int \cos^n x dx$, then $I_n = \frac{1}{n} \cos^{n-1} x \sin x + \frac{n-1}{n} I_{n-2}$
Also compute $\int \cos^{13} x dx$
5. If $I_n = \int \tan^n x dx$, then $I_n = \frac{\tan^{n-1} x}{n-1} - I_{n-2}$
Also compute $I_{17} = \int \tan^{17} x dx$
6. If $I_n = \int \cot^n x dx$, then $I_n = -\frac{1}{n-1} \cot^{n-1} x - I_{n-2}$
Also compute $I_{21} = \int \cot^{21} x dx$
7. If $I_n = \int \sec^n x dx$, then $I_n = \frac{1}{n-1} \sec^{n-2} x \tan x + \frac{n-2}{n+2} I_{n-2}$
Also compute $I_{18} = \int \sec^{18} x dx$
8. If $I_n = \int \csc^n x dx$, then $I_n = -\frac{1}{n-1} \csc^{n-2} x \cot x + \frac{n-2}{n-1} I_{n-2}$
9. If $I_n = \int_0^{\frac{\pi}{2}} \sin^n x dx$ then $I_n = \frac{n-1}{n} I_{n-2}$
Also compute $\int_0^{\frac{\pi}{2}} \sin^{11} x dx$
10. If $I_n = \int_0^{\frac{\pi}{2}} \cos^n x dx$ then $I_n = \frac{n-1}{n} I_{n-2}$
Also compute $\int_0^{\frac{\pi}{2}} \cos^9 x dx$
11. Evaluate $\int \sin^4 3x \cos^3 3x dx$
12. Evaluate $\int \sin^3 3x \cos^3 3x dx$
13. Evaluate $\int \sin^4 3x \cos^4 3x dx$
14. Evaluate $\int \tan^5 x \sec^4 x dx$
15. Evaluate $\int \tan^3 x \sec^4 x dx$
16. Evaluate $\int \tan^4 x \sec^3 x dx$
17. Find the arc length of the curve $y = \ln x$ from $x = 1$ to $x = 2$.
18. Evaluate $\int \frac{x}{x^2 + 2x + 2} dx$
19. Evaluate $\int \frac{2x-3}{x^2 - 3x - 10} dx$
20. Evaluate $\int \frac{3x+1}{3x^2 + 2x - 1} dx$

21. Evaluate $\int \frac{2x^2 + 3}{x(x-1)^2} dx$
22. Evaluate $\int \frac{2x^2 - 10x + 4}{(x+1)(x-3)^2} dx$
23. Evaluate $\int \frac{2x^2 + 3x + 3}{(x+1)^3} dx$
24. Evaluate $\int \frac{x^3 + 3x^2 + x + 9}{(x^2 + 1)(x^2 + 3)} dx$
25. Evaluate $\int \frac{dx}{x^3 + 2x}$
26. Make u -substitution to convert the integrand to a rational function of u , and then evaluate the integral
- (a) $\int \frac{dx}{1 + \sin x + \cos x}$
- (b) $\int \frac{dx}{2 + \sin x}$
- (c) $\int \frac{dx}{1 - \cos x}$
- (d) $\int \frac{dx}{4 \sin x - 3 \cos x}$
- (e) $\int \frac{dx}{\sin x + \tan x}$
- (f) $\int \frac{\sin x}{\sin x + \tan x} dx$

Debriefing:

1. How many hours did you spend on this assignment?
2. Would you rate it as easy, moderate, or difficult?
3. How deeply do you feel you understand the material it covers (0% - 100%)?