

MATH 2600: INTEGRATION REVIEW

Find the following integrals. Yep, you guessed it, check your answer by taking the derivative!

1. $\int \sqrt{4-3x} \, dx$

2. $\int x\sqrt{4-3x} \, dx$

3. $\int \frac{x}{\sqrt{4-9x^2}} \, dx$

4. $\int \frac{1}{\sqrt{4-9x^2}} \, dx$

5. $\int \frac{x^3}{\sqrt{9x^2-4}} \, dx$

6. $\int \frac{1}{x\sqrt{9x^2-4}} \, dx$

7. $\int \frac{x}{9x^2+4} \, dx$

8. $\int \frac{1}{9x^2+4} \, dx$

9. $\int \frac{1}{x^2-6x+9} \, dx$

10. $\int \frac{1}{x^2-6x+10} \, dx$

11. $\int \frac{1}{x+\sqrt{x}} \, dx$

12. $\int \frac{1}{\sqrt{x}+x\sqrt{x}} \, dx$

13. $\int \frac{e^x+1}{e^x} \, dx$

14. $\int \frac{e^x}{1+e^x} \, dx$

15. $\int \frac{e^x}{1+e^{2x}} \, dx$

16. $\int \frac{e^x}{\sqrt{1-e^x}} \, dx$

17. $\int \frac{e^x}{\sqrt{1-e^{2x}}} \, dx$

18. $\int \frac{1}{\sqrt{e^{2x}-1}} \, dx$

19. $\int \frac{\sin(x)+1}{\cos(x)} \, dx$

20. $\int \frac{\cos(x)}{\sin(x)+1} \, dx$

21. $\int \frac{1}{\sin(x)+1} \, dx$

22. $\int \frac{\arcsin(x)}{\sqrt{1-x^2}} \, dx$

23. $\int \frac{\sqrt{1+\ln(x)}}{x} \, dx$

24. $\int \frac{2^x}{\sqrt{9-4^x}} \, dx$

25. $\int \frac{e^{\arctan(x)}}{x^2+1} \, dx$

26. $\int \frac{1}{x \ln(x) \sqrt{(\ln(x))^2-1}} \, dx$

27. $\int 3e^{2\ln(x)} \, dx$

28. Find $\int \frac{2x^3-4x^2+10x-1}{x^2-2x+5} \, dx$

29. Find $\int \frac{1}{x\sqrt{x-1}} \, dx$ two ways: using $u = \sqrt{x-1}$ and $u = \sqrt{x}$.

30. Evaluate $\int_0^{\pi/2} \sqrt{1-\cos(\theta)} \, d\theta$

CHALLENGE: Find $\int_0^1 \frac{x^4(1-x)^4}{x^2+1} \, dx$

HINTS:

1. Power rule
2. $u = 4 - 3x$, $x = \frac{4 - u}{3}$
3. $u = 4 - 9x^2$
4. arcsine form
5. $u = 9x^2 - 4$, $x^2 = \frac{u + 4}{9}$
6. arcsecant form
7. $u = 9x^2 + 4$
8. arctangent form
9. Factor; power rule
10. Complete the square; arctangent form
11. Factor \sqrt{x} from denominator; $u = 1 + \sqrt{x}$.
12. Factor \sqrt{x} from denominator; $u = \sqrt{x}$; arctangent form
13. separate numerator / bring up e^x from denominator as e^{-x} and distribute
14. $u = e^x + 1$
15. $u = e^x$; arctangent form
16. $u = 1 - e^x$
17. $u = e^x$; arcsine form
18. $u = e^x$; arcsecant form (multiply numerator and denominator by e^x)
19. Separate numerator / bring $\cos(x)$ up as $\sec(x)$ / rewrite integrand as $\tan(x) + \sec(x)$.
20. $u = \sin(x) + 1$
21. Multiply numerator and denominator by conjugate: $1 - \sin(x)$ and separate numerator.
22. $u = \arcsin(x)$
23. $u = 1 + \ln(x)$
24. $u = 2^x$; arcsine form
25. $u = \arctan(x)$
26. $u = \ln(x)$; arcsecant form
27. use properties of logs and exponents to reduce integrand to $3x^2$.
28. long division then complete the square.
29. $u = \sqrt{x - 1}$ results in an arctangent form; $u = \sqrt{x}$ results in an arcsecant form.
30. $2\sqrt{2} - 2$