AP Calculus Integration Practice

AP Calculus Integration Practice - 53 questions

53 Questions | 106 min

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1. Evaluate the integral: $\int x^3\sqrt{4+x^4}dx$

2. Evaluate the integral: $\int \frac{dx}{x\ln x}$

3. Evaluate the integral: $\int \frac{(x+5)dx}{\sqrt{x+4}}$

4. Find the integer n that allows for integration by substitution, then evaluate: $\int x^n\sqrt{1-x^4}dx$

5. Find the integer n that allows for integration by substitution (two natural choices exist), then evaluate: $\int \frac{x^n}{\sqrt{1-x^4}}dx$

6. Find the integer n that allows for integration by substitution (two natural choices exist), then evaluate: $\int \frac{x^n}{1+x^{10}}dx$

7. Find the integer n that allows for integration by substitution, then evaluate: $\int \frac{x^6}{1+x^n}dx$

8. Find the integer n that allows for integration by substitution, then evaluate: $\int x^n e^{-x^2}dx$

9. Find the integer n that allows for integration by substitution, then evaluate: $\int x^n e^{2x^5}dx$

10. Find the integer n that allows for integration by substitution, then evaluate: $\int x^5\sqrt{1-x^n}dx$

11. Find the integer n that allows for integration by substitution, then evaluate: $\int \frac{x^6}{\sqrt{1-x^n}}dx$

12. Find the integer n that allows for integration by substitution, then evaluate: $\int \frac{dx}{x^n \ln x}$

13. Find the integer n that allows for integration by substitution, then evaluate: $\int \frac{dx}{x^n(\ln x)^7}$

14. Find the integer n that allows for integration by substitution, then evaluate: $\int x^n \sin(x^6)dx$

15. Find the integer n that allows for integration by substitution, then evaluate: $\int \frac{\sin^n x \cos x}{\sqrt{3+\sin^4 x}}dx$

16. Find the integer n that allows for integration by substitution, then evaluate: $\int \frac{\sin^3 x \cos x}{\sqrt{3+\sin^n x}} dx$

17. Evaluate the integral: $\int x e^{-\frac{x}{10}} dx$

18. Evaluate the integral: $\int x^2 e^{-\frac{x}{10}} dx$

19. Evaluate the integral: $\int x^2 \ln x dx$

20. Evaluate the integral for integer $n \neq -1$: $\int x^n \ln x dx$

21. Evaluate the integral: $\int x^2 \sin x dx$

22. Evaluate the integral: $\int x^3 e^{-x^2} dx$

23. Evaluate the integral: $\int x^3 \sqrt{x^2+1} dx$

24. Given that $\int f(x)dx = g(x)$ and $\int g(x)dx = h(x)$, compute: $\int x^3 f(x^2)dx$

25. Given that $\int f(x)dx = g(x)$ and $\int g(x)dx = h(x)$, compute: $\int x^{2n-1} f(x^n)dx$

26. Evaluate the integral: $\int \sin^{-1} x dx$

27. Evaluate the integral: $\int (\sin^{-1} x)^2 dx$

28. Evaluate the integral: $\int \tan^{-1} x dx$

29. Evaluate the integral: $\int \sec^3 \theta d\theta$

Hint: Write $\sec^3 \theta = \sec \theta (1 + \tan^2 \theta)$ and integrate $\sec \theta \tan^2 \theta$ by parts.

30. Evaluate the integral: $\int \frac{\sqrt{9 - x^2}}{x^2} dx$

31. Evaluate the integral: $\int \frac{dx}{x\sqrt{1-x^2}}$

32. Evaluate the integral: $\int \frac{dx}{x\sqrt{a^2+x^2}}$

33. Evaluate the integral: $\int \sqrt{4+x^2}dx$

Hint: See Problem 12 on page 3 (integral of $\sec^3\theta$).

34. Evaluate the integral: $\int \frac{dx}{a^2 - x^2}$

Note: It might be easier to do this by partial fractions.

35. Evaluate the integral: $\int \frac{\sqrt{x^2 - a^2}}{x} dx$

36. Evaluate the integral: $\int \frac{dx}{(a^2 + x^2)^2}$

37. Evaluate the integral using the substitution $x = \sin\theta$: $\int \sin^{-1} x dx$

38. Evaluate the integral: $\int (\sin^{-1} x)^2 dx$

39. Evaluate the integral: $\int \tan^{-1} x dx$

40. Evaluate the integral: $\int \frac{5x-3}{x^2-2x-3}dx$

41. Evaluate the integral: $\int \frac{6x+7}{(x+2)^2}dx$

42. Evaluate the integral: $\int \frac{2x^3-4x^2-x-3}{x^2-2x-3}dx$

43. Evaluate the integral: $\int \frac{dx}{x(x^2+1)}$

44. Evaluate the integral: $\int \left(\frac{1}{x^2+1} - \frac{1}{x^2-2x+5} \right) dx$

45. Evaluate the integral: $\int \frac{x^3+2x^2+2}{(x^2+1)^2} dx$

46. Evaluate the definite integral: $\int_0^{\frac{\pi}{2}} \frac{3}{1+\sin\theta}d\theta$

47. Evaluate the definite integral: $\int_0^{2\frac{\pi}{3}} \frac{3}{5+4\cos\theta}d\theta$

48. Evaluate the definite integral: $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{3}{4+5\cos\theta}d\theta$

49. Evaluate the definite integral: $\int_0^{\frac{\pi}{2}} \frac{5}{3\sin\theta + 4\cos\theta} d\theta$

50. Solve the initial value problem: $\frac{dy}{dx} = xy$, $y(0) = 1$

51. Solve the initial value problem: $y\frac{dy}{dx} = x^2$, $y(0) = 1$

52. Solve the initial value problem: $\frac{dy}{dx} = -2x(y+3)$, $y(0) = 1$

53. Solve the initial value problem: $\frac{dy}{dx} = \frac{x^2y + y}{x^2 - 1}$, $y(0) = 2$