

1. Compute the following:

$$\int \frac{4}{\sqrt{4 + 25t^2}} dt$$

2. Compute the following:

$$\int x^3 \ln x^2 dx$$

3. Compute the following:

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

4. Compute the following:

$$\int \frac{1}{x^3 \sqrt{x^2 - 1}} dx$$

for $x > 1$.

5. Compute the following:

$$\int \frac{\sec x}{4 - 3 \tan x} dx$$

6. Compute the following:

$$\int 3x \sin(2x) dx$$

7. Compute the following:

$$\int e^{\sqrt{x}} dx$$

8. Compute the following:

$$\int \frac{dx}{x^2 \sqrt{x^2 + 1}}$$

9. Compute the following:

$$\int \frac{3x + 4}{\sqrt{x + 1}} dx$$

10. Compute the following:

$$\int \cos(\ln x) dx$$

11. Compute the following:

$$\int \sqrt{x(6 - x)} dx$$

12. Compute the following:

$$\int \frac{1}{3 + 2 \cos x} dx$$

13. Compute the following:

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

14. Compute the following:

$$\int \frac{dx}{\sin(2x)}$$

15. Compute the following:

$$\int \sqrt{2x + 3} dx$$

16. Compute the following:

$$\int \frac{1}{\sqrt[4]{x} + \sqrt[3]{x}} dx$$

17. Compute the following:

$$\int x^3 \sin(x^2) dx$$

18. Compute the following:

$$\int \ln(x + \sqrt{x^2 - 1}) dx$$

19. Compute the following:

$$\int \frac{1}{t^3 + 8} dt$$

20. Compute the following:

$$\int \frac{x - 1}{\sqrt{x^2 - 4x + 3}} dx$$

21. Compute the following:

$$\int_{\ln(3/4)}^{\ln(4/3)} \frac{e^t}{(1 + e^{2t})^{3/2}} dt$$

22. Compute the following:

$$\int \frac{\cos x}{2 - \sin x} dx$$

23. Compute the following:

$$\int \frac{3x^4 - 11x^3 - 20x^2 + 13x - 51}{(x - 5)(x + 2)} dx$$

24. Compute the following:

$$\int \frac{x + 1}{x^2(x - 1)} dx$$

25. Compute the following:

$$\int \frac{x}{(16 - x^2)^2} dx$$

26. Compute the following:

$$\int \frac{1}{(16 - x^2)^2} dx$$

27. Compute the following:

$$\int \frac{-2 - x + 2x^2}{(-1 + x)x^2} dx$$

28. Compute the following:

$$\int \frac{dx}{2 + \tan x}$$

29. Compute the following:

$$\int x^3 e^{x^2} dx$$

30. Compute the following:

$$\int \sqrt{\sin t} \cos^3 t dt$$

31. Compute the following:

$$\int \frac{4x^2 + 54x + 134}{(x - 1)(x^2 + 8x + 15)} dx$$

32. Compute the following:

$$\int \sqrt{x} e^{\sqrt{x}} dx$$

33. Compute the following:

$$\int \sec^5 x \, dx$$

34. Compute the following:

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

35. Compute the following:

$$\int \frac{1}{\sqrt{9 - (x - 2)^2}} \, dx$$

36. Compute the following:

$$\int \tan^6 x \, dx$$

37. Compute the following:

$$\int \frac{d\theta}{2 + \cos \theta}$$

38. Compute the following:

$$\int \frac{\cos \theta}{\sin \theta \cos \theta + \sin \theta} \, d\theta$$

39. Compute the following:

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

40. Compute the following:

$$\int \frac{x^2}{(x^2 + 8)\sqrt{x^2 + 8}} \, dx$$

41. Compute the following:

$$\int \sqrt{x} \ln(x) \, dx$$

42. Compute the following:

$$\int \frac{2 + 9x + 5x^2 + 2x^3}{(3 + 2x + x^2)^2} \, dx$$

43. Derive the formula for the area of an ellipse. Recall that an ellipse has an equation of the form

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.$$

44. The area bounded by the x -axis and the function $y = \sin(x)$ for $0 \leq x \leq \pi$ is rotated about the y -axis. Find the volume.

45. Compute the length of the arc whose equation is $y = x^3$ for $0 \leq x \leq 2$.

46. Compute the area in the first quadrant bounded by the x -axis, y -axis, $y = x^2 e^x$ and $x = e$.

47. Compute the volume obtained by rotating the region in the plane bounded by the x -axis and $y = \sin x$ for $0 \leq x \leq \pi$ around a) the x -axis and b) the y -axis. Which gives more volume? Can you explain why?

48. Find the volume of a torus. That is, a circle of radius r rotated about an axis b units from the center of the circle where $b > r$.