

1. Find the derivative of y with respect to x :

$$y = 3 \arcsin(4x^3)$$

2. A conservation organization releases 40 coyotes into a preserve. After 4 years, there are 70 coyotes in the preserve. The preserve has a carrying capacity of 175.

a) Write a logistic function that models the population, $P(t)$, of coyotes in the preserve.

b) Use your answer from (a) to find $\lim_{t \rightarrow \infty} P(t)$

3. Evaluate:

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

4. Evaluate:

$$\int_0^{\pi/4} \sin^3 4x \, dx$$

5. Evaluate:

$$\arccos\left(-\frac{\sqrt{3}}{2}\right)$$

6. Find the equation of the line tangent to the curve:

$$2x + \arctan y = y^2 - 1; \text{ at the point } P\left(\frac{-\pi}{8}, -1\right)$$

7. Evaluate:

$$\int \cos^2 \theta \sin 2\theta \, d\theta$$

8. Compute $\frac{dy}{dx}$ for the function:

$$y = \sinh^2 7x$$

9. Find the function $y = f(t)$ passing through the point $(0, 15)$ with the first derivative:

$$\frac{dy}{dt} = \frac{1}{4}t$$

10. Use integration by parts to establish a reduction formula for the integral:

$$\int x^n e^x dx$$

11. Evaluate:

$$\int_0^1 \frac{1}{\sqrt{16 - x^2}} dx$$

12. Evaluate the following without use of a calculator:

$$\coth(\ln 6)$$

13. Evaluate:

$$\tan\left(\arccos\left(\frac{1}{2}\right)\right)$$

14. Evaluate:

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

15. Evaluate:

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

16. Verify the identity using the definitions of hyperbolic functions:

$$\coth x = \frac{e^{2x} + 1}{e^{2x} - 1}$$

17. Compute $\frac{dy}{dx}$ for the function:

$$y = \sinh 7x$$

18. Find the exact value of the function:

$$\operatorname{arccsc}(-2)$$

19. Evaluate:

$$\int_2^4 8x \ln x \, dx$$

20. Find the general solution of the equation. Express the solution explicitly as a function of the independent variable:

$$e^{9t} y'(t) = -2$$

21. Compute $\frac{dy}{dx}$ for the function:

$$y = \sinh^2 4x$$

22. Use l'Hopital's rule to evaluate the limit:

$$\lim_{x \rightarrow \frac{\pi}{3}} \frac{\cos(x) - \frac{1}{2}}{x - \frac{\pi}{3}}$$

23. Evaluate:

$$\int \frac{\sinh x}{1 + \cosh x} dx$$

24. Evaluate or simplify:

$$\arccos\left(\cos\left(-\frac{\pi}{3}\right)\right)$$

25. Find the exact value of the function:

$$\arcsin\left(-\frac{\sqrt{2}}{2}\right)$$

26. Evaluate the limit:

$$\lim_{x \rightarrow \infty} x \left(\frac{\pi}{2} - \arctan x \right)$$

27. Find the area of the surface generated when the given curve is revolved about the x-axis:

$$y = \frac{x^3}{3} + \frac{1}{4x}; \text{ from } x = 1 \text{ to } x = 2$$

28. Evaluate:

$$\int_0^{\ln 2} \cosh x \, dx$$

29. Compute $\frac{dy}{dx}$ for the function:

$$y = \ln \sinh 7x$$

30. Evaluate or simplify:

$$\cos(2 \arccos x)$$

31. Determine if the given function y is a solution of the differential equation y'' . Assume that C is an arbitrary constant.

$$y = C_1 \sin 5t + C_2 \cos 5t; \quad y''(t) + 25y = 0$$

32. Evaluate the integral:

$$\int \frac{2x}{x^2 + 6x + 13} dx$$

33. Evaluate:

$$\int \frac{-\csc \theta}{\csc \theta - \cot \theta} d\theta$$

34. Differentiate:

$$y = \frac{1}{2} \left[x\sqrt{4-x^4} + 4 \arcsin \frac{x}{2} \right]$$

35. Evaluate:

$$\int -\operatorname{csch}^2 x \coth x \, dx$$

36. Evaluate the expression without a calculator to a value or to show that the value does not exist. Simplify the answer to the extent possible:

$$\sinh(2 \ln 5)$$

37. Evaluate:

$$\int \frac{9}{\sqrt{64-81x^2}} dx$$

38. Find the general solution of the equation:

$$y'(t) - \frac{y}{16} = -11$$

39. Find the length of the curve:

$$y = 3x^{\frac{3}{2}}; \text{ from } x = 0 \text{ to } x = \frac{5}{9}$$

40. Evaluate:

$$\lim_{x \rightarrow -\infty} 4 \sinh x$$