

1. Compute the following:
$$\frac{d}{dx} e^x \ln(x)$$
2. Compute the following:
$$\frac{d}{dx} x^2 \arcsin x$$
3. Compute the following:
$$\frac{d}{dx} \frac{\arctan(x)}{1+x^2}$$
4. Compute the following:
$$\frac{d}{dx} \log_2(2x^2)$$
5. Compute the following:
$$\frac{d}{dx} \log_x 10$$
6. Compute the following:
$$\frac{d}{dx} 3^{2x+4}$$
7. Compute the following:
$$\frac{d}{dx} \sinh(x^2 + 1)$$
8. Compute the following:
$$\frac{d}{dx} (\sinh^2 x \cosh(2x))$$
9. Compute the following:
$$\frac{d}{dx} \frac{x}{\sinh^{-1} x}$$
 (This problem refers to the inverse hyperbolic sine function.)
10. Compute the following:
$$\frac{d}{dx} \tanh^3(3x^2 + 2x - 1)$$
11. Derive the formula for the derivative of the inverse hyperbolic tangent function.
12. Compute the following:
$$\frac{d}{dx} e^{x^2+3x-5}$$
13. Compute the following:
$$\frac{d}{dx} \left(x \operatorname{arcsec} \left(x^2/2 \right) \right)$$
14. Compute the derivatives and explain why you use the differentiation rules that you do.
 - a) $\frac{d}{dx} \sqrt{2^x}$
 - b) $\frac{d}{dx} x^{\sqrt{2}}$
15. Compute the following:
$$\int_{\pi/8}^{\pi/6} \tan(2x) dx$$
16. Compute the following:
$$\int \frac{3 \ln x^2}{x} dx$$
17. Compute the following:
$$\int \frac{1}{x \log_2 x} dx$$
18. Compute: $\int \cot(x) dx$
19. Compute the following:
$$\int \frac{\sec^2(3x)}{4 + \tan(3x)} dx$$
20. Compute the following:
$$\int \frac{e^x}{1 + e^x} dx$$

21. Compute the following:

$$\int_{-\frac{1}{2}\ln 3}^0 \left(\frac{e^x}{1 + e^{2x}} \right) dx$$

22. Compute the following:

$$\int 3^x dx$$

23. Compute the following:

$$\int \sin(x)e^{\cos(x)} dx$$

24. Compute the following:

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

25. Compute the following:

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

26. Compute the following:

$$\int x3^{x^2} dx$$

27. Compute the following:

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

28. Compute the following:

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

29. Compute the following:

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

30. Compute the following:

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

31. Compute the following:

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

32. Compute the following:

$$\frac{d}{dx} \int_{e^{-x}}^{e^x} \ln t dt$$

33. Compute in two different ways:

$$\frac{d}{dx} x^{2x}$$

34. Compute the following:

$$\frac{d}{dx} \log_x(x + 1)$$

35. Compute using logarithmic differentiation.

$$\frac{d}{dx} \sqrt[4]{\frac{(x^2 + 1)x^3}{(2x - 1)^3 \sqrt{x - 1}}}$$

36. Find the volume of the solid of revolution obtained by rotating the region bounded by the coordinate axes, $y = 3$, and $x = \frac{2}{\sqrt{y+1}}$ about the y -axes.

37. Find the absolute maximum and minimum values of the function $f(x) = e^x - 2x$ for $-1 \leq x \leq 2$.

38. Show that any curve of the form $y = -\frac{1}{2}x^2 + k$ and any curve of the form $y = \ln(x) + c$ intersect each other at right angles.

39. Show that $\cosh^{-1} x = \ln(x + \sqrt{x^2 - 1})$ as long as $x \geq 1$.