

Differentiation

Exercises

Find and simplify the derivative of the following functions:

1. $f(x) = x \ln x - x$

2. $f(x) = \sqrt{1-x^2} + x \arcsin x$

3. $f(x) = x \operatorname{arctg} x - \frac{1}{2} \ln(1+x^2)$

4. $f(x) = \ln \sqrt{\frac{e^{2x}}{1+e^{2x}}}$

5. $f(x) = \frac{x^2}{2} \left(\ln x - \frac{1}{2} \right)$

6. $f(x) = \ln \sqrt{\cos x}$

7. $f(x) = (2-x^2) \cos x + 2x \sin x$

8. $f(x) = e^x(x^3 - 3x^2 + 6x - 6)$

9. $f(x) = \frac{1}{4} \ln \frac{x^2-1}{x^2+1}$

10. $f(x) = \ln(x + \sqrt{x^2+1})$

11. $f(x) = \ln\left(\operatorname{tg} \frac{x}{2}\right)$

12. $f(x) = \frac{1}{4x^4} \ln \frac{1}{x} - \frac{1}{16x^4}$

13. $f(x) = \frac{1}{2} x \sqrt{4-x^2} + 2 \arcsin \frac{x}{2}$

14. $f(x) = \frac{x^2}{1+x^4} - \operatorname{arctg}(x^2)$

15. $f(x) = \frac{1}{2} \operatorname{arctg} \frac{2x}{1-2x^2}$

16. $f(x) = x(\arcsin x)^2 + 2 \sqrt{1-x^2} \cdot \arcsin x - 2x$

17.* $f(x) = \frac{1}{6} \ln \frac{(x+1)^2}{x^2-x+1} + \frac{1}{\sqrt{3}} \operatorname{arctg} \frac{2x-1}{\sqrt{3}}$

18.* $f(x) = \frac{x}{2} \sqrt{x^2+9} + \frac{9}{2} \ln(x + \sqrt{x^2+9})$

Results

1. $f'(x) = \ln x$

2. $f'(x) = \arcsin x$

3. $f'(x) = \operatorname{arctg} x$

4. $f'(x) = \frac{1}{1+e^{2x}}$

5. $f'(x) = x \ln x$

6. $f'(x) = -\frac{\operatorname{tg} x}{2}$

7. $f'(x) = x^2 \sin x$

8. $f'(x) = x^3 e^x$

9. $f'(x) = \frac{x}{x^4-1}$

10. $f'(x) = \frac{1}{\sqrt{1+x^2}}$

11. $f'(x) = \frac{1}{\sin x}$

12. $f'(x) = \frac{1}{x^5} \ln x$

13. $f'(x) = \sqrt{4-x^2}$

14. $f'(x) = \frac{4x}{(1+x^4)^2}$

15. $f'(x) = \frac{1+2x^2}{1+4x^4}$

16. $f'(x) = (\arcsin x)^2$

17. $f'(x) = \frac{1}{1+x^3}$

18. $f'(x) = \sqrt{x^2+9}$