Practice Problems

Differentiate each of the following functions. Assume that a is a constant. Please note that the inverse function for $\sin x$, (sometimes denoted by $\sin^{-1} x$) is denoted by $\arcsin x$ here.

1. $f(x) = e^{3-x}$
2. $f(x) = \arctan x$
3. $f(x) = \sqrt{a^2 - \sin^2 x}$
4. $f(x) = \arcsin 3x$
5. $f(x) = 2^{5x^2+1}$
6. $f(x) = \ln\left(5x^2 - 8x + 3\right)$
7. $f(x) = -\dfrac{\sin x \cos x}{2} + \dfrac{x}{2}$
8. $f(x) = e^{-x^2}$
9. $f(x) = \cos x \cdot 10^{\sin x}$
10. $f(x) = -\dfrac{1}{4}e^{-2x} - \dfrac{1}{2}xe^{-2x}$
11. $f(x) = \dfrac{1}{2}(\arcsin x)^2 + e^5$
12. $f(x) = 10 \sin 2x \cos 2x$
13. $f(x) = \dfrac{1}{2}x^2 \ln x - \dfrac{1}{4}x^2$
14. $f(x) = \arctan(10x)$
15. $f(x) = \ln(\tan x)$
16. $f(x) = \dfrac{x}{x+1}$
17. $f(x) = \arctan\left(\dfrac{x}{x+1}\right)$
18. $f(x) = \arcsin\left(x^2 - 1\right)$
19. $f(x) = \log_3(\sec x)$
20. $f(x) = \cos^{-1}\left(x^6\right)$
21. $f(x) = 2^{\sin(-5x)}$
22. $f(x) = e^{\sin x + \cos x}$
23. $f(x) = \sin\left(\ln\left(x^3\right)\right)$

Practice Problems - Answers

1. $f'(x) = -e^{3-x}$

2. $f'(x) = \dfrac{1}{x^2+1}$

3. $f'(x) = -\dfrac{\cos x \sin x}{\sqrt{a^2 - \sin^2 x}}$

4. $f'(x) = \dfrac{3}{\sqrt{1-9x^2}}$

5. $f'(x) = 10x(\ln 2)\, 2^{5x^2+1}$

6. $f'(x) = \dfrac{10x-8}{5x^2-8x+3}$

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

8. $f'(x) = -2xe^{-x^2}$

9. $f'(x) = 10^{\sin x}\left[-\sin x + (\ln 10)\cos^2 x\right]$

10. $f'(x) = xe^{-2x}$

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

12. $f'(x) = 20\cos^2 2x - 20\sin^2 2x = 20\cos 4x$

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

14. $f'(x) = \dfrac{10}{100x^2+1}$

15. $f'(x) = \dfrac{\tan^2 x + 1}{\tan x} = \tan x + \cot x$

16. $f'(x) = \dfrac{1}{(x+1)^2}$

17. $f'(x) = \dfrac{1}{2x^2+2x+1}$

18. $f'(x) = \dfrac{2x}{\sqrt{1-(x^2-1)^2}}$

19. $f'(x) = \dfrac{\tan x}{\ln 3}$

20. $f'(x) = -\dfrac{6x^5}{\sqrt{1-x^{12}}}$

21. $f'(x) = -5(\ln 2)\dfrac{\cos 5x}{2^{\sin 5x}}$

22. $f'(x) = e^{\cos x + \sin x}(\cos x - \sin x)$

23. $f'(x) = \dfrac{3}{x}\cos\left(\ln x^3\right)$

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