

Exercise 7.6

Differentiate each of the following functions with respect to x .

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| <p>1. e^{3x}</p> <p>2. e^{x^2}</p> <p>3. $\ln(x-1)^2$</p> <p>4. $(x+1)^6$</p> <p>5. $(2x^3+1)^6$</p> <p>6. $4 \ln(x^2+1)$</p> <p>7. $\sin^2 x$</p> <p>8. $(x+1)^{-1}$</p> <p>9. $e^{(x^2+3)}$</p> <p>10. $\sin\left(3x + \frac{\pi}{4}\right)$</p> <p>11. $\sin^2(x^2+1)$</p> | <p>12. $\ln(\sin x \cos x)$</p> <p>13. $(e^x - e^{-x})^{-1}$</p> <p>14. $\ln\left[\frac{\sin x}{1 - \cos x}\right]$</p> <p>15. $2 \cos^2(x^2+1)$</p> <p>16. $\frac{(2x-3)^2}{(3x+4)^3}$</p> <p>17. $\ln(1 + \cos x)$</p> <p>18. $\ln(1+x^2)^{\frac{1}{2}}$</p> <p>19. $\ln(\tan 2x)$</p> <p>20. $(x^2+5x+3)^{\frac{1}{2}}$</p> |
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21. Differentiate $x - \tan x + \frac{1}{3} \tan^3 x$ with respect to x and express your answer in terms of $\tan x$.
22. Given $f(x) = \ln(1+x) - x + \frac{1}{2}x^2$, prove that $f'(x) \geq 0$ for all values of x greater than -1 .
23. If $f(x) = x - \ln(1+x^2)$, show that $f'(x) \geq 0$ for all values of x . Deduce that $x > \ln(1+x^2)$ for all values of x greater than 0.
24. If $y = \frac{1}{\sqrt{(x-1)\sin x}}$, find $\frac{dy}{dx}$ when $x = \frac{\pi}{2}$.
25. Find $\frac{dy}{dx}$ for the curve $y = \ln\sqrt{1+\sin 2x}$ at the point where $x = \frac{\pi}{2}$.

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| <p>1. $3e^{3x}$</p> <p>3. $\frac{2}{x-1}$</p> <p>5. $36x^2(2x^3+1)^5$</p> <p>7. $2 \sin x \cos x$</p> <p>9. $2x e^{(x^2+3)}$</p> <p>11. $4x \sin(x^2+1) \cos(x^2+1)$</p> <p>12. $2 \cot 2x$</p> <p>14. $-\operatorname{cosec} x$</p> <p>16. $\frac{(2x-3)(43-6x)}{(3x+4)^4}$</p> <p>18. $\frac{x}{1+x^2}$</p> <p>20. $\frac{2x+5}{2\sqrt{(x^2+5x+3)}}$</p> <p>24. $-\frac{1}{2\left(\frac{1}{2}\pi - 1\right)^{\frac{3}{2}}}$</p> | <p>2. $2x e^{x^2}$</p> <p>4. $6(x+1)^5$</p> <p>6. $\frac{8x}{x^2+1}$</p> <p>8. $-(x+1)^{-2}$</p> <p>10. $3 \cos\left(3x + \frac{\pi}{4}\right)$</p> <p>13. $-(e^x + e^{-x})(e^x - e^{-x})^{-2}$</p> <p>15. $-4x \sin(2+2x^2)$</p> <p>17. $\frac{-\sin x}{1 + \cos x}$</p> <p>19. $\frac{2 \sec^2 2x}{\tan 2x}$</p> <p>21. $\tan^4 x$</p> <p>25. -1</p> |
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