

**2) DIFFERENTIATION BY FORMULAE AND RULES (EXCEPT OF
COMPOSITE FUNCTIONS)
APPLIED MATHEMATICS (FAPPZ)**

Calculate the first derivative $f'(x)$ of a function $y = f(x)$.

Basic.

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| 1) $y = x^2 \sqrt[3]{x^2}$ | 2) $y = x^5 - 4x^3 + 2x - 3$ |
| 3) $y = \frac{1}{4} - \frac{1}{3}x + x^2 - \frac{1}{2}x^4$ | 4) $y = \frac{a}{\sqrt[3]{x^2}} - \frac{b}{x\sqrt[3]{x}}$ |
| 5) $y = \frac{\pi}{x} + \ln 2$ | 6) $y = 5 \sin x + 3 \cos x$ |
| 7) $y = \operatorname{arctg} x + \operatorname{arccotg} x$ | 8) $y = \operatorname{tg} x - \operatorname{cotg} x$ |
| 9) $y = \log 12 + 9^x$ | 10) $y = e^5 + \log_7 x$ |
| 11) $y = x^7 e^x$ | 12) $y = x \arcsin x$ |
| 13) $y = \frac{2x + 3}{x^2 - 5x + 5}$ | 14) $y = \frac{1 + \sqrt{x}}{1 - \sqrt{x}}$ |
| 15) $y = \ln x \log x - \ln a \log_a x$ | 16) $y = \frac{1}{x} + 2 \ln x - \frac{\ln x}{x}$ |
| 17) $y = \frac{\sin x + \cos x}{\sin x - \cos x}$ | 18) $y = (x^2 - 2x + 2)e^x$ |
| 19) $y = \frac{(1 + x^2) \operatorname{arctg} x - x}{2}$ | 20) $y = \frac{x^2}{\ln x}$ |

Results.

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| 1) $\frac{8}{3}x^{5/3}$ | 2) $5x^4 - 12x^2 + 2$ |
| 3) $-\frac{1}{3} + 2x - 2x^3$ | 4) $\frac{4b}{3x^2 \sqrt[3]{x}} - \frac{2a}{3x \sqrt[3]{x^2}}$ |
| 5) $-\frac{\pi}{x^2}$ | 6) $5 \cos x - 3 \sin x$ |
| 7) 0 | 8) $\frac{4}{\sin^2 2x}$ |
| 9) $9^x \ln 9$ | 10) $\frac{1}{x \ln 7}$ |
| 11) $x^6 e^x (x + 7)$ | 12) $\arcsin x + \frac{x}{\sqrt{1 - x^2}}$ |
| 13) $\frac{-2x^2 - 6x + 25}{(x^2 - 5x + 5)^2}$ | 14) $\frac{1}{\sqrt{x}(1 - \sqrt{x})^2}$ |
| 15) $\frac{2 \ln x}{x \ln 10} - \frac{1}{x}$ | 16) $\frac{2}{x} + \frac{\ln x}{x^2} - \frac{2}{x^2}$ |
| 17) $\frac{-2}{(\sin x - \cos x)^2}$ | 18) $x^2 e^x$ |
| 19) $x \operatorname{arctg} x$ | 20) $\frac{x(2 \ln x - 1)}{\ln^2 x}$ |