

Esercizio 1. Si calcoli la derivata delle seguenti funzioni:

- a) $f(x) = x^3 \sin x + 2x \cos x$. b) $f(x) = 2 \cdot 3^x + 3 \cdot x^2$.
 c) $f(x) = x \sin x \cos x$. d) $p(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_0$ (polinomio di grado n).
 e) $f(x) = \log(\sin(\sqrt{x}))$. f) $f(x) = \sqrt{\sin(\log x)}$. g) $f(x) = \arcsin(\sqrt{x} - 1)$.
 h) $f(x) = \frac{x^2 e^x}{x-1}$. i) $f(x) = \frac{x^{\frac{2}{3}} - 4}{x^{\frac{1}{3}} - 2}$. j) $f(x) = (\log(x^n))^n$.
 k) $f(x) = \cos^2(x) \cdot \log_2(x^2)$. l) $f(x) = \frac{\sin(x^x)}{x}$.
 m) $f(x) = \left(1 + \frac{x}{2}\right)^{\frac{1}{2x}}$. n) $f(x) = \left(\log\left(\frac{x^2}{x+1}\right)\right)^{\frac{1}{x}}$.
 o) $f(x) = \frac{2^x - 3^x}{x}$; p) $f(x) = \log_{\sin x} \cos^2 x$.

Soluzioni

1. a) $(3x - 2)x \sin x + (x^3 + 2) \cos x$. b) $2 \cdot 3^x \log 3 + 6x$. c) $\sin x \cos x + x \cos(2x)$.
 d) $n a_n x^{n-1} + (n-1) a_{n-1} x^{n-2} + \dots + a_1$. e) $\frac{\cos(\sqrt{x})}{2\sqrt{x} \sin(\sqrt{x})}$, f) $\frac{\cos(\log x)}{2x \sqrt{\sin(\log x)}}$,
 g) $\frac{1}{2\sqrt{x} \sqrt{2\sqrt{x} - x}}$, h) $\frac{x e^x (x^2 - 2)}{(x-1)^2}$, i) $\frac{1 - 4x^{-\frac{1}{3}} + 4x^{-\frac{2}{3}}}{3(x^{\frac{1}{3}} - 2)^2}$,
 j) $\frac{n^2 (\log(x^n))^{n-1}}{x}$. k) $2 \cos x \left(\frac{\cos x}{x \log 2} - \sin x \cdot \log_2(x^2)\right)$;
 l) $\frac{x^{x+1} \cos(x^x) (\log x + 1) - \sin(x^x)}{x^2}$; m) $\left(1 + \frac{x}{2}\right)^{\frac{1}{2x}} \frac{x - (2+x) \log(1 + \frac{x}{2})}{2x^2(2+x)}$;
 n) $\left(\log\left(\frac{x^2}{x+1}\right)\right)^{\frac{1}{x}} \left(\frac{x+2}{x^2(x+1) \log(\frac{x^2}{x+1})} - \frac{\log(\log(\frac{x^2}{x+1}))}{x^2}\right)$; o) $\frac{2^x \log 2 - 3^x \log 3}{x} - \frac{2^x - 3^x}{x^2}$;
 p) $-2 \frac{\log(\cos x) + \operatorname{tg}^2(x) \cdot \log(\sin x)}{\operatorname{tg}(x) \cdot (\log(\sin x))^2}$.