

Universidade de São Paulo
Escola Superior de Agricultura “Luiz de Queiroz”
Departamento de Ciências Exatas
LCE 0120 - Cálculo I

Exercícios Derivada: Utilização dos teoremas

Nos exercícios a seguir determine a derivada de cada função utilizando os teoremas.

1. Obtenha a derivada de cada função a seguir:

- | | |
|--------------------------------------|--|
| (a) $f(x) = 10$ | (m) $f(x) = x \cdot \sin(x)$ |
| (b) $f(x) = x^5$ | (n) $f(x) = x^2 \cdot \ln(x)$ |
| (c) $f(x) = 10x^5$ | (o) $f(x) = (2x^2 - 3x + 5)(2x - 1)$ |
| (d) $f(x) = \frac{1}{2}x^2$ | (p) $f(x) = \frac{\sin(x)}{x^2}$ |
| (e) $f(x) = x^2 + x^3$ | (q) $f(x) = x \cdot \tan(x)$ |
| (f) $f(x) = 10x^3 + 5x^2$ | (r) $f(x) = \frac{x-1}{x-2}$ |
| (g) $f(x) = 2x + 1$ | (s) $f(x) = \frac{2}{x^3} + \frac{5}{x^2}$ |
| (h) $f(t) = 3t^2 - 6t - 10$ | (t) $f(x) = x^{\frac{2}{3}}$ |
| (i) $f(u) = 5u^3 - 2u^2 + 6u + 7$ | (u) $f(x) = x^{\frac{1}{3}} + x^{\frac{1}{4}}$ |
| (j) $f(x) = 3\ln(x) + 5$ | (v) $f(x) = 3\sqrt{x} + 5\sqrt[3]{x} + 10$ |
| (k) $f(x) = 10\ln(x) - 3x + 6$ | (w) $f(x) = \sqrt{x} \cdot \sin(x)$ |
| (l) $f(x) = 5\sin(x) + 2\cos(x) - 4$ | (x) $f(x) = \frac{\ln(x)}{\sqrt{x}}$ |

2. Obtenha a derivada as seguintes funções:

- | | |
|---|--|
| (a) $f(x) = (2x - 1)^3$ | (j) $f(x) = 5^x$ |
| (b) $f(x) = (2x - 1)^4$ | (k) $f(x) = e^x + 3^x$ |
| (c) $f(x) = (5x^2 - 3x + 5)^6$ | (l) $f(x) = e^{x^2 - 2x + 1}$ |
| (d) $f(x) = \left(\frac{1}{x^2} + \frac{1}{x} + 1\right)^3$ | (m) $f(x) = 3^{x^2 - 4}$ |
| (e) $f(x) = \frac{1}{(x^2 - 3x - 2)^5}$ | (n) $f(x) = e^{\frac{x-1}{x+1}}$ |
| (f) $f(x) = \ln(3x^2 - 2x)$ | (o) $f(x) = e^x + e^{-x}$ |
| (g) $f(x) = \ln(x^2 - 3x + 6)$ | (p) $f(x) = \frac{e^x + e^{-x}}{e^x - e^{-x}}$ |
| (h) $f(x) = \sin(x^2 - 3x)$ | (q) $f(x) = \sqrt{2x + 1}$ |
| (i) $f(x) = 2^x$ | (r) $f(x) = \sqrt[3]{2x + 1}$ |
| | (s) $f(x) = (6x^2 + 2x + 1)^{\frac{3}{2}}$ |

$$(t) f(x) = \sqrt{x+1} + \sqrt[3]{x^2-3x+1}$$

$$(u) f(x) = \sqrt{x} + \sqrt{x+1}$$

$$(v) f(x) = \sqrt{\frac{\ln(x)}{e^x}}$$

$$(w) f(x) = \sqrt{\frac{x+1}{3x-2}}$$

$$(x) f(x) = \ln(\sqrt{3x^2+1})$$

3. Calcule a derivada das seguintes funções:

$$(a) f(x) = (x)^{x^2}$$

$$(b) f(x) = (x+1)^x$$

$$(c) f(x) = (x)^{\ln(x)}$$

4. Obtenha a derivada das funções:

$$(a) f(x) = \arcsin(3x-5)$$

$$(b) f(x) = \arccos\left(\frac{x}{4}\right)$$

$$(c) f(x) = \arctan(x^2-5)$$

Respostas

1. (a) $f'(x) = 0$

(b) $f'(x) = 5x^4$

(c) $f'(x) = 50x^4$

(d) $f'(x) = x$

(e) $f'(x) = 2x + 3x^2$

(f) $f'(x) = 30x^2 + 10x$

(g) $f'(x) = 2$

(h) $f'(t) = 6t - 6$

(i) $f'(u) = 15u^2 - 4u + 6$

(j) $f'(x) = \frac{3}{x}$

(k) $f'(x) = \frac{10}{x} - 3$

(l) $f'(x) = 5\cos(x) - 2\sin(x)$

(m) $f'(x) = \sin(x) + x\cos(x)$

(n) $f'(x) = 2x\ln(x) + x$

(o) $f'(x) = 12x^2 - 16x + 13$

(p) $f'(x) = \frac{\cos(x)}{x^2} - \frac{2\sin(x)}{x^3}$

(q) $f'(x) = \tan(x) + x(1 + \tan(x)^2)$

(r) $f'(x) = -\frac{1}{(x-2)^2}$

(s) $f'(x) = -\frac{6}{x^4} - \frac{10}{x^3}$

(t) $f'(x) = \frac{2}{3x^{1/3}}$

(u) $f'(x) = \frac{1}{3x^{2/3}} + \frac{1}{4x^{3/4}}$

(v) $f'(x) = \frac{3}{2\sqrt{x}} + \frac{5}{3x^{3/2}}$

(w) $f'(x) = \frac{1}{2} \frac{\sin(x)}{\sqrt{x}} + \sqrt{x}\cos(x)$

(x) $f'(x) = \frac{1}{x^{3/2}} - \frac{1}{2} \frac{\ln(x)}{x^{3/2}}$

2. (a) $f'(x) = 6(2x-1)^2$

(b) $f'(x) = 8(2x-1)^3$

(c) $f'(x) = 6(5x^2-3x+5)^5(10x-3)$

(d) $f'(x) = 3\left(\frac{1}{x^2} + \frac{1}{x} + 1\right)^2\left(-\frac{2}{x^3} - \frac{1}{x^2}\right)$

(e) $f'(x) = -\frac{5(2x-3)}{(x^2-3x-2)^6}$

(f) $f'(x) = \frac{6x-2}{3x^2-2x}$

(g) $f'(x) = \frac{2x-3}{x^2-3x+6}$

(h) $f'(x) = \cos(x^2-3x)(2x-3)$

$$(i) f'(x) = 2^x \ln(2)$$

$$(j) f'(x) = 5^x \ln(5)$$

$$(k) f'(x) = e^x + 3^x \ln(3)$$

$$(l) f'(x) = (2x-2)e^{x^2-2x+1}$$

$$(m) f'(x) = 2 \cdot 3^{x^2-4} x \cdot \ln(3)$$

$$(n) f'(x) = \left(\frac{1}{x+1} - \frac{x-1}{x+1}\right) e^{\frac{x-1}{x+1}}$$

$$(o) f'(x) = e^x - e^{-x}$$

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

$$(q) f'(x) = \frac{1}{\sqrt{2x+1}}$$

$$(r) f'(x) = \frac{2}{3(2x+1)^{\frac{2}{3}}}$$

$$(s) f'(x) = \frac{3}{2} \sqrt{6x^2 + 2x + 1} (12x + 2)$$

$$(t) f'(x) = \frac{1}{2\sqrt{x+1}} + \frac{1}{3} \frac{2x-3}{(x^2-3x+1)^{\frac{2}{3}}}$$

$$(u) f'(x) = \frac{1}{2\sqrt{x}} + \frac{1}{2\sqrt{x+1}}$$

$$(v) f'(x) = -\frac{1}{2} \frac{(-1 + \ln(x) \cdot x) \cdot e^{-x}}{\sqrt{\ln(x) \cdot e^{-x} \cdot x}}$$

$$(w) f'(x) = -\frac{5}{2\sqrt{\frac{x+1}{3x-2}}} \cdot (3x-2)^2$$

$$(x) f'(x) = \frac{3x}{3x^2+1}$$

$$3. (a) f'(x) = x^{x^2} \cdot (2\ln(x) \cdot x + x)$$

$$(b) f'(x) = (x+1)^x (\ln(x+1) + \frac{x}{x+1})$$

$$(c) f'(x) = \frac{2x^{\ln(x)} \ln(x)}{x}$$

$$4. (a) f'(x) = \frac{3}{\sqrt{-24-9x^2+30x}}$$

$$(b) f'(x) = -\frac{1}{\sqrt{16-x^2}}$$

$$(c) f'(x) = \frac{2x}{1+(x^2-5)^2}$$