

**Plano de Aquisição de
Conhecimentos essenciais
DERIVAÇÃO**

Plano de Aquisição de Conhecimentos Essenciais

Regras de Derivação

A. Conhecimento

Reproduza a regra indicada no cálculo da derivada de cada uma das seguintes funções:

Regra: $(f^p)' = pf^{p-1}f'$

1. $f(x) = x^4$

2. $f(x) = x^9$

Nota: $(af)' = af'$

3. $f(x) = 10x$

4. $f(x) = 10x^4$

5. $f(x) = \frac{1}{2}x^4$

6. $f(x) = \frac{1}{2}x^9$

7. $f(x) = \frac{3x^7}{5}$

8. $f(x) = (3x)^4$

9. $f(x) = (4x)^9$

10. $f(x) = \frac{2}{5}(3x)^4$

11. $f(x) = \frac{(3x)^4}{5}$

12. $f(x) = \frac{2(3x)^7}{5}$

13. $f(x) = 2\left(\frac{3}{2}x\right)^7$

Nota: $\sqrt[q]{f^p} = f^{p/q}$

14. $f(x) = \sqrt{x}$

15. $f(x) = \sqrt[3]{x^2}$

16. $f(x) = \sqrt[3]{(3x)^2}$

17. $f(x) = \frac{\sqrt[4]{x^5}}{3}$

18. $f(x) = \sqrt[3]{\frac{x}{27}}$

19. $f(x) = \sqrt[3]{\frac{x^2}{27}}$

20. $f(x) = \frac{1}{2}\sqrt[3]{\frac{x^2}{4}}$

Nota: $\frac{1}{f^p} = f^{-p}$

21. $f(x) = \frac{1}{x^3}$

22. $f(x) = \frac{1}{x^{-5}}$

23. $f(x) = \frac{3}{x^4}$

24. $f(x) = \frac{1}{(3x)^2}$

25. $f(x) = \frac{2}{(3x)^2}$

26. $f(x) = \frac{1}{\sqrt[3]{x^2}}$

27. $f(x) = \frac{2}{\sqrt[3]{x^2}}$

28. $f(x) = \frac{2}{3\sqrt[3]{x^4}}$

29. $f(x) = \frac{3}{2\sqrt{(2x)^{-3}}}$

30. $f(x) = \frac{\sqrt[3]{(2x)^2}}{2\sqrt{(2x)^{-3}}}$

Plano de Aquisição de Conhecimentos Essenciais

Regras de Derivação

A. Conhecimento

Reproduza a regra de derivação indicada no cálculo da derivada de cada uma das seguintes funções:

$$\text{Regra: } (f + g)' = f' + g'$$

$$1. f(x) = x^2 + \frac{x}{5}$$

$$2. f(x) = \frac{(2x)^6}{7} + \frac{3x}{5}$$

$$3. f(x) = x^3 + \frac{3x}{5} + \frac{1}{x^2}$$

$$4. f(x) = \frac{\sqrt[3]{x}}{5} + \frac{x^3}{3}$$

$$5. f(x) = \sqrt[3]{(2x)^2} + \frac{2x^3}{3}$$

$$6. f(x) = \frac{\sqrt[3]{2x}}{7} + \frac{(2x)^3}{3}$$

$$7. f(x) = \sqrt{x^3} - \frac{2}{\sqrt[3]{x^2}}$$

$$8. f(x) = 3 - x\sqrt{x} + \frac{3x^2}{\sqrt{x^3}}$$

$$9. f(x) = x^2\sqrt{x} + \frac{3\sqrt[3]{x}}{\sqrt{x^3}}$$

$$10. f(x) = (x-1)^3$$

$$11. f(x) = \frac{3(2x-1)^2}{4}$$

$$12. f(x) = \frac{(x^4-1)^2}{4}$$

$$13. f(x) = \frac{3(x^3+3)^2}{2}$$

$$14. f(x) = \frac{\sqrt[3]{(2x-1)^2}}{5}$$

$$15. f(x) = \frac{3}{2\sqrt[3]{(x+2)^2}}$$

$$16. f(x) = \frac{2}{\sqrt[3]{x^3-2}}$$

$$17. f(x) = \frac{(\sqrt{x}+2)^2}{2}$$

$$18. f(x) = \frac{1}{\sqrt[3]{x^3+8}} - \frac{\sqrt{x+5}}{2}$$

$$19. f(x) = \frac{1}{(x^2-2)^2} - \sqrt{\frac{1}{x+1}}$$

$$20. f(x) = \frac{3}{(\sqrt{x}+2)^2} - 2(\sqrt[3]{x}+3)^2$$

$$\text{Regra: } (f * g)' = f'g + fg'$$

$$1. f(x) = \sqrt{x}(x-1)$$

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

$$3. f(x) = (x^3-2x)\left(\sqrt{3x} - \frac{1}{x}\right)$$

$$\text{Regra: } \left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$$

$$1. f(x) = \frac{(3x-2x^2)}{x-1}$$

$$2. f(x) = \frac{6x-2x\sqrt{x}}{9-x}$$

$$3. f(x) = \frac{4x^3 - \sqrt[3]{x^2}}{2x-4}$$

$$4. f(x) = \frac{(x-1)(2x^2+1)}{x-2}$$

Plano de Aquisição de Conhecimentos Essenciais

Regras de Derivação

A. Conhecimento

Reproduza a regra de derivação indicada no cálculo da derivada de cada uma das seguintes funções:

$$\text{Regra: } (e^f)' = f'e^f$$

$$(a^f)' = f'a^f \ln(a)$$

1. $f(x) = e^x$
2. $f(x) = e^{4x}$
3. $f(x) = 10^{2x+1}$
4. $f(x) = 5e^{2x} + 3$
5. $f(x) = e^{x^2}$
6. $f(x) = e^{1+2x^2}$
7. $f(x) = 2e^{x^2} + 1$
8. $f(x) = e^{\sqrt{x}}$
9. $f(x) = e^{\sqrt{x+1}}$
10. $f(x) = e^{3\sqrt{x+1}}$
11. $f(x) = 3^{\sqrt{2x+1}}$
12. $f(x) = \sqrt{e^{2x-1}}$
13. $f(x) = (\sqrt{e^{2x} + 2})$
14. $f(x) = \sqrt[3]{e^{2x-1}}$
15. $f(x) = \frac{\sqrt[3]{e^{x^2}}}{5}$
16. $f(x) = e^{1/x}$
17. $f(x) = \frac{1}{e^{2x}}$
18. $f(x) = (e^x + e^{-x})$

$$\text{Regra: } (\ln f)' = \frac{f'}{f}$$

$$(\log_a f)' = \frac{f'}{f \ln a}$$

1. $f(x) = \ln(x)$
2. $f(x) = \ln(2x)$
3. $f(x) = \ln(x+5)$
4. $f(x) = \ln(x) + 5$
5. $f(x) = \ln(x^2 + 2)$
6. $f(x) = \ln(2x^3)$
7. $f(x) = \ln(\sqrt{x})$
8. $f(x) = \log_2(3x^2)$
9. $f(x) = \ln(3\sqrt{x} + 5)$
10. $f(x) = \ln(\sqrt[3]{x^2} + 3)$
11. $f(x) = \ln(3x^3 + \sqrt[3]{2x})$
12. $f(x) = \ln(x + e^{-x})$
13. $f(x) = \ln(1 + e^{\sqrt{x}})$
14. $f(x) = \ln(e^{\sqrt{x}} + x^2)$
15. $f(x) = e^{\sqrt{\ln(x+1)}}$
16. $f(x) = \ln^2(\sqrt{x+1})$
17. $f(x) = \sqrt{\ln(x^2 + 1)}$
18. $f(x) = \frac{\ln^3(x^2 + 1)}{5}$
19. $f(x) = \sqrt[3]{\ln^2(x+2)} + 3$
20. $f(x) = \ln^{-2}(e^{x^2} + 2)$

Plano de Aquisição de Conhecimentos Básicos

Regras de Derivação

A. Conhecimento

Reproduza a regra de derivação indicada no cálculo da derivada de cada uma das seguintes funções:

$$\begin{aligned} \text{Regra: } (\operatorname{sen} f)' &= f' \cos f \\ (\cos f)' &= -f' \operatorname{sen} f \end{aligned}$$

1. $f(x) = \operatorname{sen}(3x)$
2. $f(x) = \operatorname{sen}(x+1)$
3. $f(x) = \operatorname{sen}(x^2)$
4. $f(x) = \cos(2x^2)$
5. $f(x) = \cos(\sqrt{x})$
6. $f(x) = \operatorname{sen}^2(x)$
7. $f(x) = 2\operatorname{sen}^3(x+1)$
8. $f(x) = \operatorname{sen}(e^{2x})$
9. $f(x) = \cos(\ln(x))$
10. $f(x) = \frac{e^{2\operatorname{sen}x}}{6}$
11. $f(x) = \sqrt{1+e^{\operatorname{sen}(x)}}$
12. $f(x) = e^{\cos^2(x)}$
13. $f(x) = \ln(\cos(2x))$
14. $f(x) = \ln(\operatorname{sen}(\frac{3}{x}))$
15. $f(x) = \operatorname{sen}(\ln(\sqrt{x+1}))$
16. $f(x) = \ln(\cos^2(e^x))$
17. $f(x) = 3\cos^2(\ln(x^2+3))$
18. $f(x) = \sqrt[3]{\operatorname{sen}(x+1)^2}$
19. $f(x) = \sqrt[3]{\operatorname{sen}(e^x+1)}$

$$\begin{aligned} \text{Regra: } (tg f)' &= f' \sec^2 f \\ (\cotg f)' &= -f' \operatorname{cosec}^2 f \end{aligned}$$

1. $f(x) = tg(2x)$
2. $f(x) = tg(x^3)$
3. $f(x) = \cotg(\sqrt{x})$
4. $f(x) = \cotg(\sqrt{x^2+1})$
5. $f(x) = tg\left(\frac{2}{(\sqrt{x+1})^2}\right)$
6. $f(x) = \cotg^2(x+\pi)$
7. $f(x) = \sqrt{\cotg(2x^2)}$
8. $f(x) = 2tg(e^x)$
9. $f(x) = \cotg(e^{x+2})$
10. $f(x) = tg(\ln(x^2+1))$
11. $f(x) = tg(\operatorname{sen}(x))$
12. $f(x) = tg^3(\operatorname{sen}(3x))$
13. $f(x) = \frac{\cotg(\sqrt[3]{e^x})}{3}$
14. $f(x) = tg(\operatorname{sen}(e^x))$
15. $f(x) = \sqrt{\cotg(\ln(x))}$
16. $f(x) = e^{tg(x+1)}$
17. $f(x) = \ln(\cotg(\sqrt[3]{x^2}))$
18. $f(x) = \operatorname{sen}(\cotg(\frac{2}{x^2}))$
19. $f(x) = \cos(tg(e^{x+1}))$

$$\text{Regra: } (\sec f)' = f' \sec f \operatorname{tg} f$$

$$(\operatorname{cosec} f)' = -f' \operatorname{cosec} f \cot g f$$

1. $f(x) = \operatorname{cosec}(2x^2)$
2. $f(x) = \operatorname{cosec}(2x^2 + x)$
3. $f(x) = \frac{\sec(\ln(x^2))}{3}$
4. $f(x) = \sec(\sqrt{e^{\operatorname{sen} x}})$
5. $f(x) = \sec^2(\operatorname{sen}(x))$
6. $f(x) = \frac{\sec(x)}{\cos^2(x)}$
7. $f(x) = \ln(\sec(2x))$
8. $f(x) = e^{\sec(x^2)}$

$$\text{Regra: } (\operatorname{arcsen} f)' = \frac{f'}{\sqrt{1-f^2}}$$

$$(\arccos f)' = -\frac{f'}{\sqrt{1-f^2}}$$

1. $f(x) = \operatorname{arcsen}(3x)$
2. $f(x) = \operatorname{arcsen}(\operatorname{tg}(x))$
3. $f(x) = \operatorname{arcsen}\sqrt{1-x^2}$
4. $f(x) = \arccos(\sqrt{1-e^x})$
5. $f(x) = \operatorname{arcsen}^3(\ln(x))$
6. $f(x) = \sqrt{\arccos(e^x)}$
7. $f(x) = \operatorname{arcsen}(\ln(x^2 + 1))$
8. $f(x) = \frac{e^{\operatorname{arcsen}(3x)}}{4}$
9. $f(x) = \arccos(e^x)(e^x + 1)$
10. $f(x) = \frac{\operatorname{arcsen}\sqrt{1-x^2}}{3\sqrt{1-x^2}}$
11. $f(x) = \ln(\operatorname{arcsen}\sqrt{x})$

$$\text{Regra: } (\operatorname{arctg} f)' = \frac{f'}{1+f^2}$$

$$(\operatorname{arcotg} f)' = -\frac{f'}{1+f^2}$$

1. $f(x) = \operatorname{arctg}(2x+1)$
2. $f(x) = \operatorname{arctg}(x^2)$
3. $f(x) = \operatorname{arctg}(\operatorname{sen}(x))$
4. $f(x) = \operatorname{arctg}(\ln(x))$
5. $f(x) = \operatorname{arctg}(e^x)$
6. $f(x) = (\operatorname{arctg}(x^2))^2$
7. $f(x) = \frac{\operatorname{arcotg}(x)}{(1+x^2)}$
8. $f(x) = \frac{3\sqrt{\operatorname{arctg}(e^x)}}{2}$

Plano de Aquisição de Conhecimentos Essenciais

Regras de Derivação

C. Aplicação

Aplique as regras de derivação no cálculo da derivada de cada uma das seguintes funções:

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

b. $f(x) = 5e^{4x} + 3$

c. $f(x) = 5e^{x^2}$

d. $f(x) = \ln(5x)$

e. $f(x) = \ln(3x + 5)$

f. $f(x) = \ln(x^3) + 2$

g. $f(x) = \sin(3x)$

h. $f(x) = \sin(x^2)$

i. $f(x) = \sin(\ln(x))$

j. $f(x) = \sin(e^{2x})$

k. $f(x) = \cos(2x^2)$

l. $f(x) = \sin^2(x)$

m. $f(x) = \tan(x^3)$

n. $f(x) = \operatorname{cosec}(2x^2)$

o. $f(x) = x^3 - \frac{2x}{3} - \frac{1}{x}$

p. $f(x) = \frac{2}{x^2} + \frac{3}{5x^5}$

q. $f(x) = \sqrt{x^3} - \frac{2}{\sqrt[3]{x^2}}$

r. $f(x) = 3 - x\sqrt{x} + \frac{3x^2}{\sqrt{x^3}}$

s. $f(x) = (x^2 - 2x)\left(\sqrt{3x} - \frac{1}{x}\right)$

t. $f(x) = \frac{(3x - 2x^2)}{x - 1}$

u. $f(x) = \frac{6x - 2x\sqrt{x}}{9 - x}$

v. $f(x) = \frac{e^{2\sin x}}{6}$

x. $f(x) = \ln(\sin(x^2))$

z. $f(x) = \ln(x + e^{-x})$

a1. $f(x) = \frac{e^x + e^{-x}}{e^x - e^{-x}}$

b1. $f(x) = \frac{3xe^{-x}}{\sqrt{e^x}}$

c1. $f(x) = (\arctg(x^2))^2$

d1. $f(x) = \ln(\cos(e^x))$

e1. $f(x) = \arcsen\sqrt{1 - x^2}$

f1. $f(x) = \sqrt[n]{x - 2}, n \in \mathbb{N}$

g1. $f(x) = \sqrt[3]{x - 2}$

h1. $f(x) = \sqrt{1 + e^{\sin(x)}}$

i1. $f(x) = \arctg\sqrt{1 + \sin(x)}$

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Regras de Derivação

D. Análise

1-Para cada função selecione a opção que corresponde à respetiva derivada:

1.1. $F(x) = \frac{2}{x^2}$

(a) $f(x) = \frac{2}{x^4}$ (b) $f(x) = \frac{4}{x^3}$ (c) $f(x) = -\frac{2}{x^3}$ (d) $f(x) = -\frac{4}{x^3}$

1.2. $F(x) = \sqrt{x^2 + 4}$

(a) $f(x) = \frac{2x}{\sqrt{x^2 + 4}}$ (b) $f(x) = \frac{x}{\sqrt{x^2 + 4}}$ (c) $f(x) = \frac{2x}{x+2}$ (d) $f(x) = \frac{x}{x+2}$

1.3. $F(x) = \frac{x}{x^2 + 1}$

(a) $f(x) = -\frac{1}{x^2 + 1}$ (b) $f(x) = \frac{1-x^2}{x^2 + 1}$ (c) $f(x) = \frac{1-x^2}{(x^2 + 1)^2}$ (d) $f(x) = \frac{(x-1)^2}{(x^2 + 1)^2}$

1.4. $F(x) = \ln(\ln(x^2))$

(a) $f(x) = \frac{2}{x \ln(x)}$ (b) $f(x) = \frac{1/x}{\ln(x)}$ (c) $f(x) = \frac{1}{x \ln(x^2)}$ (d) $f(x) = \frac{2x}{\ln(x)}$

1.5. $F(x) = \arcsen(2x)$

(a) $f(x) = \frac{2}{\sqrt{x^2 - 4}}$ (b) $f(x) = \frac{2}{\sqrt{4 - x^2}}$ (c) $f(x) = \frac{2}{\sqrt{1 - 4x^2}}$ (d) $f(x) = \frac{2}{\sqrt{1 - 2x^2}}$

1.6. $F(x) = \arctg(2x + 1)$

(a) $f(x) = \frac{2}{1 + 4x^2}$ (b) $f(x) = \frac{2}{2 + 4x^2}$ (c) $f(x) = \frac{1}{2 + 4x + 4x^2}$ (d) $f(x) = \frac{1}{1 + 2x + 2x^2}$

2-Faça as correspondências entre derivada e respectiva função:

Derivada($f(x)$)	função($F(x)$)
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BLOCO I	
a) $f(x) = 2x$	1. $F(x) = 3x^3$
b) $f(x) = 9x^2$	2. $F(x) = 3x^3 + x$
c) $f(x) = 2(x + 1)$	3. $F(x) = (x^2 + 1)^2$
d) $f(x) = 9x^2 + 1$	4. $F(x) = x^2$
e) $f(x) = 4x(x^2 + 1)$	5. $F(x) = (x + 1)^2$

BLOCO II	
f) $f(x) = \text{sen}(x)$	6. $F(x) = \text{tg}(2x)$
g) $f(x) = -2x\cos(x^2)$	7. $F(x) = \cos^2(x)$
h) $f(x) = 2\sec^2(2x)$	8. $F(x) = -\cos(x)$
i) $f(x) = -2\cos(x)\text{sen}(x)$	9. $F(x) = -\text{sen}(x^2)$
j) $f(x) = -3x^2\text{sen}(x^3)$	10. $F(x) = \cos(x^3)$

BLOCO III	
k) $f(x) = 2\text{tg}(2x)$	11. $F(x) = \ln(x^2 + 1)$
l) $f(x) = 2\cotg(2x)$	12. $F(x) = \frac{\ln(x^3 + 1)}{3}$
m) $f(x) = \frac{2x}{x^2 + 1}$	13. $F(x) = -\ln(\cos(2x))$
n) $f(x) = \frac{1}{x}$	14. $F(x) = \ln(\text{sen}(2x))$
o) $f(x) = \frac{x^2}{x^3 + 1}$	15. $F(x) = \ln(2x)$

BLOCO IV	
p) $f(x) = \frac{1}{2\sqrt{x+1}}$	16. $F(x) = \sqrt{2\ln(x^2)}$
q) $f(x) = \frac{1}{\sqrt[3]{(x+1)^2}}$	17. $F(x) = 3\sqrt[3]{x+1}$
r) $f(x) = \frac{x}{\sqrt{x^2+1}}$	18. $F(x) = \sqrt{x+1}$
s) $f(x) = \frac{1}{x\sqrt{\ln(x)}}$	19. $F(x) = \sqrt{\ln(x)}$
t) $f(x) = \frac{1}{2x\sqrt{\ln(x)}}$	20. $F(x) = \sqrt{x^2+1}$

BLOCO V	
u) $f(x) = \frac{e^{\sqrt{x}+1}}{2\sqrt{x}}$	21. $F(x) = e^{\sin(x)}$
v) $f(x) = 2xe^{x^2}$	22. $F(x) = \sqrt{1-e^{2x}}$
w) $f(x) = \frac{-e^{2x}}{\sqrt{1-e^{2x}}}$	23. $F(x) = e^{\sqrt{x}}$
x) $f(x) = \frac{e^{\sqrt{x}}}{2\sqrt{x}}$	24. $F(x) = e^{x^2}$
y) $f(x) = \cos(x)e^{\sin(x)}$	25. $F(x) = e^{\sqrt{x}+1}$

BLOCO VI	
z) $f(x) = \frac{-1}{9+x^2}$	26. $F(x) = \arctg(2x)$
aa) $f(x) = \frac{3}{\sqrt{1-9x^2}}$	27. $F(x) = \arcsen(\frac{x}{2})$
bb) $f(x) = \frac{2}{1+4x^2}$	28. $F(x) = \arcsen(2x)$
cc) $f(x) = \frac{1}{\sqrt{4-x^2}}$	29. $F(x) = \frac{1}{3} \arctg(\frac{x}{3})$
dd) $f(x) = \frac{2}{\sqrt{1-4x^2}}$	30. $F(x) = -\arccos(3x)$

3-Faça as correspondências entre derivada e respectiva função:

Derivada($f(x)$)	função($F(x)$)
a) $f(x) = \frac{-\operatorname{sen}\sqrt{2x}}{\sqrt{2x}}$	1. $F(x) = \arccos(e^x)$
b) $f(x) = \frac{\operatorname{sen}(x)\cos(x)}{\sqrt{\operatorname{sen}^2(x)+1}}$	2. $F(x) = \ln(x)$
c) $f(x) = \frac{1}{\sqrt{4-x^2}}$	3. $F(x) = \operatorname{arctg}(\frac{x}{3})$
d) $f(x) = \frac{1}{x}$	4. $F(x) = \ln(x^2)$
e) $f(x) = 3x^2\cos(x^3+1)$	5. $F(x) = \cos(e^x)$
f) $f(x) = \frac{2}{x}$	6. $F(x) = e^{\operatorname{arctg}(x)}$
g) $f(x) = \frac{-3e^{3x}}{2\sqrt{1-e^{3x}}}$	7. $F(x) = \cos(\sqrt{2x})$
h) $f(x) = \frac{3}{9+x^2}$	8. $F(x) = \sqrt{\operatorname{sen}^2(x)+1}$
i) $f(x) = -e^x\operatorname{sen}(e^x)$	9. $F(x) = \operatorname{arcsen}(\frac{x}{2})$
j) $f(x) = \frac{-1}{(x+1)^2}$	10. $F(x) = \sqrt{1-e^{3x}}$
k) $f(x) = \cotg(x)$	11. $F(x) = \frac{1}{\sqrt{x}}$
l) $f(x) = \frac{\cos(x)}{2-\cos^2(x)}$	12. $F(x) = \ln(\operatorname{tg}(x))$
m) $f(x) = \frac{e^{\operatorname{arctg}(x)}}{1+x^2}$	13. $F(x) = \sqrt{x^2+1}$
n) $f(x) = \frac{2\operatorname{sen}(x)}{(\cos(x)+1)^2}$	14. $F(x) = \ln(\operatorname{sen}(x))$
o) $f(x) = \frac{-e^x}{\sqrt{1-e^{2x}}}$	15. $F(x) = \cotg(\ln(x))$
p) $f(x) = \frac{e^x}{e^x+2}$	16. $F(x) = \frac{2}{\cos(x)+1}$
q) $f(x) = \frac{x}{\sqrt{x^2+1}}$	17. $F(x) = \frac{1}{x+1}$
r) $f(x) = \frac{2}{\operatorname{sen}(2x)}$	18. $F(x) = \ln(e^x+2)$
s) $f(x) = \frac{-1}{x\operatorname{sen}^2(\ln(x))}$	19. $F(x) = \operatorname{sen}(x^3+1)$
t) $f(x) = \frac{-1}{2\sqrt{x^3}}$	20. $F(x) = \operatorname{arctg}(\operatorname{sen}(x))$