



SOLUÇÕES DOS EXERCÍCIOS PROPOSTOS DA FICHA DE EXERCÍCIOS 2

1. (a) $x^3 + \frac{5}{2}x^2 + 7x + c, \quad c \in \mathbb{R}$
(b) $\frac{3}{4}\sqrt[3]{x^4} + c, \quad c \in \mathbb{R}$
(c) $\frac{x^7}{7} + \frac{x^4}{2} + x + c, \quad c \in \mathbb{R}$
(d) $\frac{(\operatorname{arctg} x)^2}{2} + c, \quad c \in \mathbb{R}$
(e) $\ln |1 + x^3| + c, \quad c \in \mathbb{R}$
(f) $-\frac{1}{6x^6} + c, \quad c \in \mathbb{R}$
(g) $\frac{1}{8} \ln(2 + 4x^2) + \frac{\sqrt{2}}{4} \operatorname{arctg}(\sqrt{2}x) + c, \quad c \in \mathbb{R}$
(h) $\operatorname{sen} x^4 + c, \quad c \in \mathbb{R}$
(i) $-\sqrt{1 - x^2} + c, \quad c \in \mathbb{R}$
(j) $-\frac{\cos^6 x}{6} + c, \quad c \in \mathbb{R}$
(k) $-\ln |\cos x| + c, \quad c \in \mathbb{R}$
(l) $\frac{(\ln x)^2}{2} + c, \quad c \in \mathbb{R}$
(m) $e^{\operatorname{tg} x} + c, \quad c \in \mathbb{R}$
(n) $\frac{1}{2 \ln 7} 7^{x^2} + c, \quad c \in \mathbb{R}$
(o) $-\frac{\sqrt{2}}{2} \cos(\sqrt{2}x) + c, \quad c \in \mathbb{R}$
(p) $\frac{x^2}{2} + \ln |x| + c, \quad c \in \mathbb{R}$
(q) $-\frac{1}{5\sqrt{7+5x^2}} + c, \quad c \in \mathbb{R}$
(r) $\frac{1}{4} \operatorname{arctg}(x^4) + c, \quad c \in \mathbb{R}$
(s) $\frac{5}{3} \operatorname{arcsen}(x^3) + c, \quad c \in \mathbb{R}$
(t) $\frac{\sqrt{7}}{7} \operatorname{arctg}\left(\frac{x}{\sqrt{7}}\right) + c, \quad c \in \mathbb{R}$
2. $F(x) = 2 \ln |x| - \frac{3}{x} - 2$
3. $\frac{\pi}{8}(\sqrt{2} - 2)$
4. $F(x) = -\frac{1}{x} + x - \frac{3}{2}$
5. (a) $x \operatorname{sen} x + \cos x + c, \quad c \in \mathbb{R}$
(b) $x^2 \operatorname{sen} x + 2x \cos x - 2 \operatorname{sen} x + c, \quad c \in \mathbb{R}$
(c) $-\frac{2x+3}{3} e^{-3x} - \frac{2}{9} e^{-3x} + c, \quad c \in \mathbb{R}$
(d) $x(\ln^2 x - 2 \ln x + 2) + c, \quad c \in \mathbb{R}$
(e) $\frac{-e^{2x} \cos x + 2e^{2x} \operatorname{sen} x}{5} + c, \quad c \in \mathbb{R}$
(f) $\frac{x \operatorname{sen}(\ln x) - x \cos(\ln x)}{2} + c, \quad c \in \mathbb{R}$
(g) $x \operatorname{arcsen} x + \sqrt{1 - x^2} + c, \quad c \in \mathbb{R}$
(h) $\frac{x^2}{2} \operatorname{arcsen}(x^2) + \frac{1}{2} \sqrt{1 - x^4} + c, \quad c \in \mathbb{R}$
(i) $x \operatorname{arctg} x - \frac{1}{2} \ln(1 + x^2) + c, \quad c \in \mathbb{R}$

- (j) $x \operatorname{arctg} \frac{1}{x} + \frac{1}{2} \ln(1+x^2) + c, \quad c \in \mathbb{R}$
- (k) $\frac{2}{3} \sqrt{x^3} \ln x - \frac{4}{9} \sqrt{x^3} + c, \quad c \in \mathbb{R}$
- (l) $\frac{\operatorname{sen}^2 x}{2} + c, \quad c \in \mathbb{R}$
6. (a) $\frac{\sec x \operatorname{tg} x + \ln |\sec x + \operatorname{tg} x|}{2} + c, \quad c \in \mathbb{R}$
- (b) $\frac{\operatorname{tg}^4 x}{4} + c, \quad c \in \mathbb{R}$
- (c) $\operatorname{tg} x - x + c, \quad c \in \mathbb{R}$
- (d) $\frac{1}{2} \theta + \frac{1}{4} \operatorname{sen}(2\theta) + c, \quad c \in \mathbb{R}$
- (e) $\frac{1}{2} x - \frac{1}{4} \operatorname{sen}(2x) + c, \quad c \in \mathbb{R}$
- (f) $-\cos t + \frac{1}{3} \cos^3 t + c, \quad c \in \mathbb{R}$
- (g) $\ln |\cos x| + \frac{1}{2} \sec^2 x + c, \quad c \in \mathbb{R}$
- (h) $-\frac{1}{3} \cos(3x) + \frac{1}{5} \operatorname{sen}(5x) + c, \quad c \in \mathbb{R}$
- (i) $\frac{\operatorname{tg}^2 x}{2} + c, \quad c \in \mathbb{R}$
- (j) $-\frac{\cos^3 x}{3} + \frac{2}{5} \cos^5 x - \frac{\cos^7 x}{7} + c, \quad c \in \mathbb{R}$
- (k) $\frac{1}{16} x - \frac{1}{64} \operatorname{sen}(4x) + \frac{1}{48} \operatorname{sen}^3(2x) + c, \quad c \in \mathbb{R}$
- (l) $\frac{1}{12} \operatorname{sen}(6x) + \frac{1}{8} \operatorname{sen}(4x) + c, \quad c \in \mathbb{R}$
7. (a) $\frac{3}{7} \ln |x-1| + \frac{4}{7} |x+6| + c, \quad c \in \mathbb{R}$
- (b) $\frac{1}{8} \ln |x-1| - \frac{1}{8} \ln |x+1| + \frac{1}{4(x+1)} + \frac{1}{4(x+1)^2} + c, \quad c \in \mathbb{R}$
- (c) $\frac{1}{12} \ln |x+2| - \frac{1}{24} \ln(x^2 - 2x + 4) + \frac{\sqrt{3}}{12} \operatorname{arctg} \left(\frac{x-1}{\sqrt{3}} \right) + c, \quad c \in \mathbb{R}$
- (d) $\frac{x^3}{3} + 5x + 8 \ln \left| \frac{x-3}{x+3} \right| + c, \quad c \in \mathbb{R}$
- (e) $-\frac{3}{4} \ln |x| - \frac{1}{4x} + \frac{13}{16} \ln |x-2| + \frac{15}{16} \ln |x+2| + c, \quad c \in \mathbb{R}$
- (f) $\frac{1}{3} (2 \ln |x-1| - \ln(x^2 + x + 1)) + c, \quad c \in \mathbb{R}$
- (g) $\ln |x| - \frac{1}{2} \ln(1+x^2) + \frac{1}{2(x^2+1)} + c, \quad c \in \mathbb{R}$
- (h) $\frac{1}{2} \ln(x^2 + 4x + 5) - \operatorname{arctg}(x+2) + c, \quad c \in \mathbb{R}$
8. (a) $-\frac{2}{3}(1-x)\sqrt{1-x} - \frac{2}{7}(1-x)^3\sqrt{1-x} + \frac{4}{5}(1-x)^2\sqrt{1-x} + c, \quad c \in \mathbb{R}$
- (b) $\frac{6}{7} x \sqrt[6]{x} - \frac{6}{5} \sqrt[6]{x^5} + 2\sqrt{x} - 6\sqrt[6]{x} + 6\operatorname{arctg} \sqrt[6]{x} + c, \quad c \in \mathbb{R}$
- (c) $\frac{1}{48}(2x+5)^{12} - \frac{5}{44}(2x+5)^{11} + c, \quad c \in \mathbb{R}$
- (d) $-\frac{\sqrt{9-x^2}}{9x} + c, \quad c \in \mathbb{R}$
- (e) $\arccos \frac{1}{x} + c, \quad c \in \mathbb{R}$
- (f) $-\frac{1}{2} \ln \left| \frac{\sqrt{x^2+4}}{x} + \frac{2}{x} \right| + c, \quad c \in \mathbb{R}$
- (g) $\frac{3\sqrt{2}}{4} \arcsen \left(\sqrt{\frac{2}{3}} x \right) + \frac{1}{2} x \sqrt{3-2x^2} + c, \quad c \in \mathbb{R}$
- (h) $2\arcsen \frac{x+1}{\sqrt{2}} - \frac{(x+1)\sqrt{2-(x+1)^2}}{2} + 2\sqrt{2-(x+1)^2} + c, \quad c \in \mathbb{R}$
- (i) $\frac{\sqrt{x^2-7}}{7x} + c, \quad c \in \mathbb{R}$
- (j) $\frac{3}{2} \sqrt[3]{2x+3} - 3\sqrt[6]{2x+3} + 3 \ln(\sqrt[6]{2x+3} + 1) + c, \quad c \in \mathbb{R}$
9. (a) $-\sqrt{3-x^2} + \arcsen \frac{x}{\sqrt{3}} + c, \quad c \in \mathbb{R}$
- (b) $\frac{3}{8} x - \frac{1}{4} \operatorname{sen}(2x) + \frac{1}{32} \operatorname{sen}(4x) + c, \quad c \in \mathbb{R}$
- (c) $\frac{1}{2} \operatorname{arctg} \left(\frac{x+1}{2} \right) + c, \quad c \in \mathbb{R}$
- (d) $\ln \left| \sqrt{\frac{2+x^2}{2}} + \frac{x}{\sqrt{2}} \right| + c, \quad c \in \mathbb{R}$

- (e) $-2 \cos \sqrt{x} + c, \quad c \in \mathbb{R}$
(f) $3 \ln |x - 3| - 2 \ln |x - 2| + c, \quad c \in \mathbb{R}$
(g) $\arcsen(x - 1) + c, \quad c \in \mathbb{R}$
(h) $\frac{(1+x^2)^2 \sqrt{1+x^2}}{5} + c, \quad c \in \mathbb{R}$
(i) $x - 2\sqrt{x} + 2 \ln(1 + \sqrt{x}) + c, \quad c \in \mathbb{R}$
(j) $\frac{x^2}{2} \ln x - \frac{x^2}{4} + c, \quad c \in \mathbb{R}$
(k) $\frac{1}{4}x - \frac{1}{8} \ln(e^{2x} + 4) + \frac{1}{2} \operatorname{arctg} \frac{e^x}{2} + c, \quad c \in \mathbb{R}$
(l) $\frac{x^2+1}{2} \operatorname{arctg} x - \frac{1}{2}x + c, \quad c \in \mathbb{R}$
(m) $-\frac{1}{2(1-\cos x)^2} + c, \quad c \in \mathbb{R}$
(n) $(\frac{2}{3}x^3 + 3x) \operatorname{arctg} x - \frac{1}{3}x^2 - \frac{7}{6} \ln(1 + x^2) + c, \quad c \in \mathbb{R}$
(o) $\ln \left| \frac{x+1+\sqrt{(x+1)^2-4}}{2} \right| + c, \quad c \in \mathbb{R}$
(p) $2\sqrt{1+e^x} + \ln |\sqrt{1+e^x} - 1| - \ln(\sqrt{1+e^x} + 1) + c, \quad c \in \mathbb{R}$
(q) $2 \operatorname{arctg} \sqrt{e^x - 1} + c, \quad c \in \mathbb{R}$
(r) $-2\sqrt{\cos x} + \frac{2}{5}\sqrt{\cos^5 x} + c, \quad c \in \mathbb{R}$
(s) $\frac{1}{2} \ln(\ln^2 x + 1) + c, \quad c \in \mathbb{R}$
(t) $\frac{1}{2}e^{x^2}(x^2 - 1) + c, \quad c \in \mathbb{R}$
(u) $-\ln |x - 2| + \frac{5}{4} \ln |x - 3| - \frac{1}{4} \ln |x + 1| + c, \quad c \in \mathbb{R}$
10. (a) $\frac{2}{3}\sqrt{1+x^3} + c, \quad c \in \mathbb{R}$
(b) $-\frac{\sqrt{1+x^2}}{x} + c, \quad c \in \mathbb{R}$
(c) $\frac{1}{2}(\ln(x^2 + 1) - 2 \ln |x| + 6 \operatorname{arctg} x) + c, \quad c \in \mathbb{R}$
(d) $\frac{x}{2} - \frac{1}{4} \ln(e^{2x} + 2) + c, \quad c \in \mathbb{R}$
11. $f(x) = 2x^3 + 2x + 1$
12. $f(x) = 2 \ln(e^x + 3) - \ln 4$