1. (a) Não há solução. (b) $x = 1$. (c) $x = -3$. (d) Não há solução. (e) $x = -3$. (f) $x = -2 \log 2$. (g) $x = \frac{\ln 12}{3}$. (h) $x = \frac{1 + \log_2 5}{2}$. (i) $x = \ln \left(\frac{10}{3}\right)$. (j) $x = \frac{2 \log_3 2}{5}$. (k) $x = \frac{1 + \log_2 17}{3}$. (l) $x = \frac{\ln(17/2)}{12}$. (m) (n) $x = \frac{\log(5/4)}{5}$. (o) $x = -100 \log_5 2$. (p) $x = \frac{3 - 4 \ln 2}{5}$. (q) $x = \frac{5 \log_2 5}{6}$. (r) (s) $x = \frac{\ln 200 - 1}{2}$. (t) $x = -\frac{\log_2 75}{2}$. (u) (v) $x = -\frac{2 \log 3 + \log 2}{3 \log 2 - \log 3}$. (w) $x = -3 \ln 2$. (x) $t = \frac{\log 26/25 3}{2}$. (y) $t = \frac{\log_{161/160} 2}{12}$. 

2. (a) $x = \ln 3$. (b) (c) $x = 0$ ou $x = \frac{4}{3}$. (d) $x = \frac{-1 - \sqrt{5}}{2}$ ou $x = \frac{-1 + \sqrt{5}}{2}$. 

3. (a) $x = \frac{95}{3}$. (b) $x = -25$. (c) (d) $x = 2$ ou $x = 4$. (e) (f) $x = 4$. (g) $x = \frac{21}{13}$. (h) $x = 4$. (i) $x = 5$. (j) (k) $5^{-2 \log_5 2}$.
4. (a) Uma solução. (b) Duas soluções. (c) Uma solução. (d)

5. (a) $S = \mathbb{R}$. (b) $S = (\log 2, \log 5)$. (c) $S = [8, 16]$. (d) $S = (2, 4) \cup (7, 9)$. (e) $S = (-\sqrt{3}/3, \sqrt{33})$.

6. (a) $f^{-1}(x) = -3 + \log_3 x$, $x > 0$. (b) $f^{-1}(x) = \frac{e^x}{3}$.

7. $f^{-1}(x) = \text{arccosh } x = \ln(x + \sqrt{x^2 - 1})$, $x \geq 1$.

8. $f^{-1}(x) = \text{arcsenh } x = \ln(x + \sqrt{x^2 + 1})$.

9. (a) $T(t) = 5 + 100e^{-0.11t}$. (b) $T(20) = 5 + 100e^{-0.11 \cdot 20} \approx 16^\circ C$.

10. (a) $t(I) = \frac{5}{13} \ln \left( \frac{60}{60 - 13I} \right)$.

11. (a) $x = -\frac{2\sqrt{2}}{3}$. (b) $x = 0$. (c) 

12. (a) $(-\sqrt{3}/2, -1/2)$. (b) $(1/2, -\sqrt{3}/2)$. (c) $(\sqrt{3}/2, -1/2)$.

13.

14.

15. (a) $(-\frac{3}{5}, \frac{4}{5})$; (b) $(-\frac{3}{5}, -\frac{4}{5})$; (c) 

16. (a) $\bar{t} = \frac{\pi}{4}$. (b) $\bar{t} = \frac{\pi}{6}$. (c) $\bar{t} = \frac{\pi}{4}$. (d) $\bar{t} = \frac{\pi}{6}$.

(e) $\bar{t} = \frac{\pi}{4}$. (f) $\bar{t} = \frac{\pi}{6}$. (g) $\bar{t} = \frac{\pi}{3}$.
17. (a) \((\sqrt{2}/2, \sqrt{2}/2)\) e \((-\sqrt{2}/2, \sqrt{2}/2)\).
(b) \((\sqrt{3}/2, 1/2)\) e \((\sqrt{3}/2, -1/2)\).
(c) \((\sqrt{2}/2, \sqrt{2}/2)\) e \((-\sqrt{2}/2, -\sqrt{2}/2)\).
(d) \((\sqrt{2}/2, \sqrt{2}/2)\) e \((\sqrt{2}/2, \sqrt{2}/2)\).
(e) \((1/2, \sqrt{3}/2)\) e \((-1/2, -\sqrt{3}/2)\).

18. (a) \(\text{sen} \pi/3 = \sqrt{3}/2, \cos \pi/3 = 1/2, \tg \pi/3 = \sqrt{3}, \cotg \pi/3 = \sqrt{3}/3, \sec \pi/3 = 2, \cosec \pi/3 = 2\sqrt{3}/3\).
(b) \(\text{sen} 4\pi/3 = -\sqrt{3}/2, \cos 4\pi/3 = -1/2, \tg 4\pi/3 = \sqrt{3}, \cotg 4\pi/3 = \sqrt{3}/3, \sec 4\pi/3 = -2, \cosec 4\pi/3 = -2\sqrt{3}/3\).
(c) \(\text{sen}(-5\pi/3) = \sqrt{3}/2, \cos(-5\pi/3) = 1/2, \tg(-5\pi/3) = \sqrt{3}, \cotg(-5\pi/3) = \sqrt{3}/3, \sec(-5\pi/3) = 2, \cosec(-5\pi/3) = 2\sqrt{3}/3\).
(d) \(\text{sen}(4\pi/3 + 2k\pi) = -\sqrt{3}/2, \cos(4\pi/3 + 2k\pi) = -1/2, \tg(4\pi/3 + 2k\pi) = \sqrt{3}, \cotg(4\pi/3 + 2k\pi) = \sqrt{3}/3, \sec(4\pi/3 + 2k\pi) = -2, \cosec(4\pi/3 + 2k\pi) = -2\sqrt{3}/3\).

19.

20. \(\text{sen} t = -\sqrt{1 - \cos^2 t}, \tg t = -\frac{1 - \cos^2 t}{\cos t} \) e \(\cotg t = -\frac{\cos t}{\sqrt{1 - \cos^2 t}}\).

21. \(\text{sen} t = \frac{\tg t}{\sqrt{1 + \tg^2 t}}, \cos t = \frac{1}{\sqrt{1 + \tg^2 t}}, \cotg t = \frac{1}{\tg t}, \sec t = \sqrt{1 + \tg^2 t} \) e \(\cosec t = \frac{\sqrt{1 + \tg^2 t}}{\tg t}\).

22.
23. (a) Período $2\pi$, amplitude 2 e fase $-\pi/3$.

(b) Período $2\pi$, amplitude 3 e fase $-\pi/4$. 
(c) Período $3\pi$, amplitude 2 e fase $\pi/4$.

![Graph](image)

(d) Período $2\pi/3$, amplitude 1 e fase $-\pi/6$.

![Graph](image)
(e) Período 2, amplitud 3 e fase $-1/2$.

24. (a)
25. (a) $1/80$ min.
   (b) $140/90$.
   (c) 80 batidas por minuto.

26. (a)
27. (a) $1080^\circ = 6\pi$ rad.  
(b)  
(c) $-735^\circ = -\frac{49\pi}{12}$ rad.

28. (a) $3\text{ rad} = \frac{540^\circ}{\pi}$.  
(b)  
(c) $-\frac{13\pi}{12}$ rad $= -195^\circ$.

29.