1. The domain of the logarithm function is $(0, \infty)$. In other words, we can only plug positive numbers into a logarithm! We can't plug in zero or a negative number.

2. $\log_b b = 1$.

3. $\log_b 1 = 0$.

4. $\log_b b^x = x$.

5. $b^{\log_b x} = x$.

6. According 4 and 5, $f(x) = b^x$ and$g(x) = \log_b x$are inverses of each other.

7. $\log_b xy = \log_b x + \log_b y$.

8. $\log_b(\frac{x}{y}) = \log_b x - \log_b y$.

9. $\log_b x^r = r \log_b x$.

10. $\log_b(x + y) \neq \log_b x + \log_b y$.

11. $\log_b(x - y) \neq \log_b x - \log_b y$.

12. $\log_b x = \frac{\ln x}{\ln b}$ and $\log_b x = \frac{\log x}{\log b}$.

1.6 Exercises

1. Determine if each of the following are functions.
   (a) $y = x^2 + 1$.
   (b) $y^2 = x + 1$.

2. Given $f(x) = 3x - 2$ and $g(x) = \frac{1}{3}x + \frac{2}{3}$ find each of the following.
   (a) $(fog)(x)$.
   (b) $(gog)(x)$.
   (c) $(gof)(x)$.

3. Given $f(x) = 3x - 2$ find $f^{-1}(x)$.

4. Given $g(x) = \sqrt{x - 3}$ find $g^{-1}(x)$.

5. Given $h(x) = \frac{x+4}{2x-5}$ find $h^{-1}(x)$.

6. Evaluate each of the following
   (a) $\sin(\frac{2\pi}{3})$ and $\sin(\frac{-2\pi}{3})$.
   (b) $\cos(\frac{7\pi}{6})$ and $\cos(\frac{-7\pi}{6})$.
   (c) $\tan(\frac{-\pi}{4})$ and $\tan(\frac{7\pi}{4})$.
   (d) $\sec(\frac{25\pi}{6})$.

7. Solve $2\cos(t) = \sqrt{3}$ on $[-2\pi, 2\pi]$.

8. Solve $2\sin(5x) = -\sqrt{3}$ on $[-\pi, 2\pi]$.

9. Solve $9\sin(2x) = -5\cos(2x)$ on $[-10, 0]$.

10. Solve $6\sin(\frac{x}{2}) = 1$ on $[-20, 30]$.

11. Solve $3\sin(5z) = -2$ on $[0, 1]$.

12. Solve $7\sec(3t) = -10$.

13. Solve $\cos(4\theta) = -1$.

14. Solve $2\cos(6y) + 11\cos(6y)\sin(3y) = 0$.

15. Solve $4\sin^2(\frac{t}{3}) - 3\sin(\frac{t}{3}) = 1$.

16. Write each of the following in terms of simpler logarithms.
   (a) $\ln x^3y^4z^5$
   (b) $log_3(\frac{9x^4}{\sqrt{y}})$
   (c) $log(\frac{x^2+y^2}{(x-y)^3})$

17. Solve $7 + 15\mathbf{e}^{1-3z} = 10$.

18. Solve $10^{t^2-t} = 100$.

19. Solve $x - x\mathbf{e}^{5x+2} = 0$.

20. Solve $5(x^2 - 4) = (x^2 - 4)\mathbf{e}^{7-x}$.

21. Solve $4\mathbf{e}^{1+3x} - 9\mathbf{e}^{5-2x} = 0$.

22. Solve $3 + 2\ln(\frac{x}{7} + 3) = -4$.

23. Solve $2\ln(\sqrt{x}) - \ln(1 - x) = 2$.

24. Solve $\log x + \log(x - 3) = 1$.