1. Solve the logarithmic equation for x.

   (a) $\ln x = 8$

   (b) $\ln(x-3) = 1$

   (c) $\log_{10} x = -4$

   (d) $\log_{10}(2x+4) = 2$

   (e) $5 - \log_{10}(4-x) = 2$

   (f) $\log_{10}(3x-1) = \log_{10}(4-x)$

   (g) $\log_2\left(x^3\right) = \log_2(x)$

   (h) $\ln\left(8-x^2\right) = \ln(2-x)$

   (i) $\log_5\left(18-x^2\right) = \log_5(6-x)$

   (j) $\ln\left(x^2-99\right) = 0$

   (k) $\log_{10}(x^2-3x) = 1$

   (l) $3\ln(x) - 2 = 1 - \ln(x)$

   (m) $\log_3(x-4) + \log_3(x+4) = 2$

   (n) $2\log_7(x) = \log_7(2) + \log_7(x+12)$

   (o) $\ln(\ln(x)) = 3$

   (p) $\ln(3-5x) = 0$

   (q) $\log_{10}(x) - \log_{10}(2) = \log_{10}(x+8) - \log_{10}(x+2)$

   (r) $\log_3(x+1) + \log_3 4 = \log_3 5 + \log_3(2x-1)$

2. Find the inverse function for each of the following logarithmic functions.

   (a) $f(x) = \log_6(4x+4)$

   (b) $f(x) = \log_2(x-3) - 5$

   (c) $f(x) = 4\log_3(x+5)$

   (d) $f(x) = \ln(2x+1)$

   (e) $f(x) = 3\ln(3x-5)$

   (f) $f(x) = 4 - \ln(x+5)$

   (g) $f(x) = 6 - \ln(1-2x)$

   (h) $f(x) = 7\ln(x+6)$

   (i) $f(x) = 3\ln(x-4) + 5$

   (j) $f(x) = 1 - \ln(4-3x)$

Answers

1. (a) $x = e^8$ (b) $x = e + 3$ (c) $x = 10^{-4}$ (d) $x = 48$
   (e) $x = -996$ (f) $x = \dfrac{5}{4}$ (g) $x = 1$ (h) $x = -2$
   (i) $x = -3,\ 4$ (j) $x = \pm 10$ (k) $x = -2,\ 5$ (l) $x = e^{3/4}$
   (m) $x = 5$ (n) $x = 6$ (o) $x = e^{e^3}$ (p) $x = 2/5$
   (q) $x = 4$ (r) $x = 3/2$

2. (a) $f^{-1}(x) = \dfrac{6^x - 4}{4}$ (b) $f^{-1}(x) = 2^{x+5} + 3$ (c) $f^{-1}(x) = 3^{x/4} - 5$
   (d) $f^{-1}(x) = \dfrac{e^x - 1}{2}$ (e) $f^{-1}(x) = \dfrac{e^{x/3} + 5}{3}$ (f) $f^{-1}(x) = e^{4-x} - 5$
   (g) $f^{-1}(x) = \dfrac{1 - e^{6-x}}{2}$ (h) $f^{-1}(x) = e^{x/7} - 6$ (i) $f^{-1}(x) = e^{(x-5)/3} + 4$
   (j) $f^{-1}(x) = \dfrac{4 - e^{1-x}}{3}$