Logarithmic functions: Homework solutions

Mr. Neeman. 10B, August 30th, 2011

Note: the first 5 questions are taken from the homework on the Aug. 28 hand-out.

#H1. Solve: $\log_6(3x) = 10$
$3x = 6^{10}$
$x = \dfrac{6^{10}}{3}$

#H2. Solve: $7^{2-5x} + 2 = 6$
$7^{2-5x} = 4$
$2 - 5x = \log_7 4$
$x = \dfrac{2 - \log_7 4}{5}$

#H3. Solve: $\log_{1.3}(4x - 7) + 2 = 7$
$\log_{1.3} 4x - 7 = 5$
$4x - 7 = 1.3^5$
$x = \dfrac{1.3^5 + 7}{4}$

#H4. Solve: $2^{x^2-1} = 5$
$x^2 - 1 = \log_2 5$
$x = \pm\sqrt{1 + \log_2 5}$

#H5. Solve: $0.7^{3x} + 10 = 23$
$0.7^{3x} = 13$
$3x = \log_{0.7} 13$
$x = \dfrac{\log_{0.7} 13}{3}$

#H6. Consider the function $f(x) = \log_3 x$. Find
(a) the image of $\dfrac{1}{9}$
$\log_3 \dfrac{1}{9} = \log_3(3^{-2}) = -2$

(b) the preimage of 0
$\log_3 x = 0$
$x = 3^0 = 1$

(c) the image of $\sqrt[5]{9}$.
$\log_3 \sqrt[5]{9} = \log_3((3)^{\frac{2}{5}}) = \dfrac{2}{5}$

#H7. Consider the function $f(x) = \log_{\frac{1}{5}} x$. Find
(a) the image of 25
$\log_{\frac{1}{5}} 25 = \log_{\frac{1}{5}}((\dfrac{1}{5})^-2) = -2$

(b) the preimage of $-\dfrac{1}{2}$
$\log_{\frac{1}{5}} x = -\dfrac{1}{2}$
$x = \dfrac{1}{5}^{-\frac{1}{2}} = \sqrt{5}$

(c) the image of $\sqrt{\frac{1}{5}}$

$\log_{\frac{1}{5}} \sqrt{\frac{1}{5}} = \log_{\frac{1}{5}}((\frac{1}{5})^{\frac{1}{2}}) = \frac{1}{2}$

(d) the preimage of 0.

$\log_{\frac{1}{5}} x = 0$

$x = \frac{1}{5}^{0} = 1$

#H8. Consider the function $f(x) = \log_8 x$. Find

(a) the image of 2

$\log_8 2 = \log_8(8^{\frac{1}{3}}) = \frac{1}{3}$

(b) the preimage of $-\frac{1}{2}$

$\log_8 x = -\frac{1}{2}$

$x = 8^{-\frac{1}{2}} = \frac{1}{\sqrt{8}}$

(c) the image of $\frac{1}{64}$

$\log_8 \frac{1}{64} = \log_8(8^{-2}) = -2$

(d) the preimage of -1.

$\log_8 x = -1$

$x = 8^{-1} = \frac{1}{8}$