Practice for Midterm #2.
Mr. Neeman. 10B. September 16.

#1. Consider the function $f(x) = \log_{\frac{1}{6}} x$.
(a) Find the image of $\dfrac{1}{\sqrt{6}}$.
(b) Find the image of 36.
(c) Find the preimage of -1.
(d) Find the preimage of $\dfrac{3}{2}$.
(e) Find the function's intersection with the x axis.
(f) Sketch the function's graph, labeling your result from (c).
(g) Is the function increasing or decreasing?
(h) What is the function's concavity?
(i) What is the equation of the function's asymptote?
(j) What is the function's range?
(k) What is the function's domain?
(l) If the function's domain was restricted to $[6, \infty[$, what would be the range?
(m) What would the domain have to be for the range to be $[-1, 1[$?

#2. Consider the function $f(x) = -2 - \log_2 x$.
(a) Find the image of 16.
(b) Find the image of 1.
(c) Find the preimage of 0.
(d) Find the preimage of $-\dfrac{5}{2}$.
(e) Find the function's intersection with the x axis.
(f) Sketch the function's graph, labeling your result from (c).
(g) Is the function increasing or decreasing?
(h) What is the function's concavity?
(i) What is the equation of the function's asymptote?
(j) What is the function's range?
(k) What is the function's domain?
(l) If the function's domain was restricted to $]2, 8]$, what would be the range?
(m) What would the domain have to be for the range to be $]-\infty, 2]$?

#3. Express each of the following as a single logarithm.
(a) $2\log_2 x - \log_2(y^3)$
(b) $\log_5 \sqrt{xy} + \log_5 \dfrac{x}{z}$
(c) $\log_3(3x) - \log_9(xy^4)$
(d) $\log_4(3x) - \log_4(y^{-3}) + 2\log_4(xy^2)$

#4. Express each of the following in terms of $\log_2 x$ and $\log_2 y$ (constants are ok, of course).
(a) $\log_8(xy^2)$
(b) $\log_2 \sqrt{x^3y^{-1}}$
(c) $\log_2 \dfrac{xy}{\sqrt{x}} - \log_2 x$
(d) $\log_4 x - \log_{\frac{1}{2}}(xy)$

#5. Solve each of the following equations.
(a) $\left(\dfrac{1}{3}\right)^{5x+2} - 4 = 8$
(b) $\log_4(x^3 + 2) = 2$
(c) $\log_3 x + \log_3(x - 5) = \log_3 14$
(d) $\log_5 x - \log_5(x + 2) - 1 = 0$