Math 114
Midterm 3 Review

You should be able to solve the following without a calculator

[1]   Find the domains of the following functions.

    [a] $f(x) = 4^x$ [b] $f(x) = \log_3 x$

[2]   Find the ranges of the following functions.

    [a] $f(x) = 5^x$ [b] $f(x) = \log_7 x$

[3]   Evaluate the following. Write "UNDEFINED" if the value does not exist.

[a]	$\log_3 \sqrt{3}$	[b]	$\log_4 \dfrac{1}{16}$
[c]	$\log_5 125$	[d]	$\log_7 0$
[e]	$\log_8 -8$	[f]	$\log_6 1$
[g]	$\log_2 64$	[h]	$\log 10000$
[i]	$\log_4 4^6$	[j]	$\log_8 8^{-3}$
[k]	$3^{\log_3 7}$	[l]	$6^{\log_6 0}$
[m]	$5^{\log_5 -10}$	[n]	$10^{\log 5}$

[4]   Find the exact solutions of the following equations. **Check your answers.**

[a]	$3^{2-x} = 81$	[b]	$8^{3x-7} = 4^{6-x}$
[c]	$\log_4(5x + 9) = 3$	[d]	$\log_3(x^2 - 7) - \log_3(1 - x) = 1$
[e]	$\log_2(10x - 2) - \log_2(x + 1) = 3$	[f]	$\log(2x + 6) + \log(x - 2) = 2$

[5]   Write as the logarithm of a single quantity. Simplify your answer.

[a]	$\log 8 + \log 5$	[b]	$\log 42 - \log 6$
[c]	$5 \log 2$	[d]	$3 \log x + 2 \log y$
[e]	$2 \log x - \log y + \log z$	[f]	$\log z - 2 \log y - \log x$
[g]	$2 \log y + 3 \log z - \log x$	[h]	$4 \log z + \log x + 3 \log y$

[6]   Write as the sums and/or differences and/or multiples of logarithms of numbers or single variables.

    [a] $\log(7 \times 11)$ [b] $\log\left(\dfrac{13}{5}\right)$

    [c] $\log 3^8$ [d] $\log r^4 s$

    [e] $\log \dfrac{a^5}{b^2}$ [f] $\log \dfrac{m}{n^2 p^3}$

    [g] $\log \dfrac{x^2}{\sqrt{yz}}$

[7]   **MULTIPLE CHOICE**

[a]   The graph of $f(x) = \log(x+4) + 5$ has an asymptote at

[i] $x = 4$ [ii] $x = -4$ [iii] $y = -4$ [iv] $y = -5$ [v] $y = 5$

[b]   The graph of $f(x) = -\log_3(x-5) - 3$ has an asymptote at

[i] $x = 5$ [ii] $x = -5$ [iii] $x = 3$ [iv] $y = -3$ [v] $y = 5$

[c]   The graph of $f(x) = -2^{x-4} + 5$ has an asymptote at

[i] $x = 4$ [ii] $x = -4$ [iii] $y = -5$ [iv] $y = 5$ [v] $x = 5$

[d]   The graph of $f(x) = \left(\dfrac{2}{3}\right)^{x+2} - 4$ has an asymptote at

[i] $x = 2$ [ii] $x = -2$ [iii] $x = -4$ [iv] $y = 4$ [v] $y = -4$

[e]   For the function $f(x) = \log_2 x$, as the value of $x \to \infty$, the value of $y \to$

[i] ∞ [ii] $-\infty$ [iii] 0 [iv] 1 [v] -1

[f]   For the function $f(x) = \log_2 x$, as the value of $x \to 0$, the value of $y \to$

[i] ∞ [ii] $-\infty$ [iii] 0 [iv] 1 [v] -1

[g]   For the function $f(x) = \log_{0.5} x$, as the value of $x \to \infty$, the value of $y \to$

[i] ∞ [ii] $-\infty$ [iii] 0 [iv] 1 [v] -1

[h]   For the function $f(x) = \log_2 x$, as the value of $x \to 0$, the value of $y \to$

[i] ∞ [ii] $-\infty$ [iii] 0 [iv] 1 [v] -1

[j]   For the function $f(x) = 3^x$, as the value of $x \to \infty$, the value of $y \to$

[i] ∞ [ii] $-\infty$ [iii] 0 [iv] 1 [v] -1

[k]   For the function $f(x) = 3^x$, as the value of $x \to -\infty$, the value of $y \to$

[i] ∞ [ii] $-\infty$ [iii] 0 [iv] 1 [v] -1

[m]   For the function $f(x) = \left(\dfrac{3}{4}\right)^x$, as the value of $x \to \infty$, the value of $y \to$
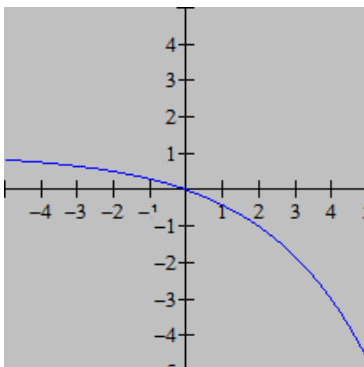
[i] ∞ [ii] $-\infty$ [iii] 0 [iv] 1 [v] -1

[n]   For the function $f(x) = \left(\dfrac{3}{4}\right)^x$, as the value of $x \to -\infty$, the value of $y \to$

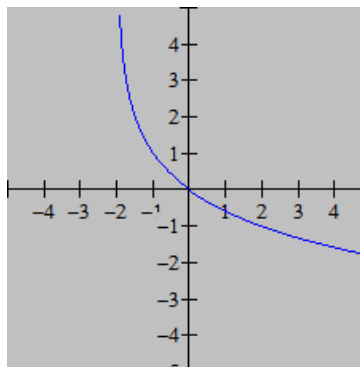[i] ∞ [ii] $-\infty$ [iii] 0 [iv] 1 [v] -1

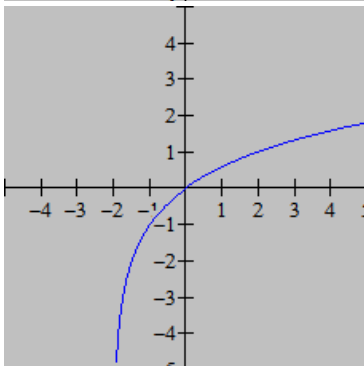[8]   Circle the graph of $f(x) = -\log_2(x+2) + 1$.
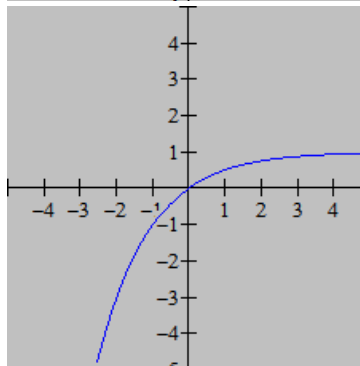
[a]

[b]

[c]

[d]

You may use a non-graphing calculator for the following

[9]   Draw the graph of $f(x) = -2^{x-1} + 3$ by finding and plotting functions values, and connecting to get the shape of the graph. Show the functions values of at least 5 points on your graph. LABEL ALL ASYMPTOTES CLEARLY.

[10]   Find the exact solution of the following equations. Also, use your calculator to find a decimal answer, rounded to 4 decimal places.

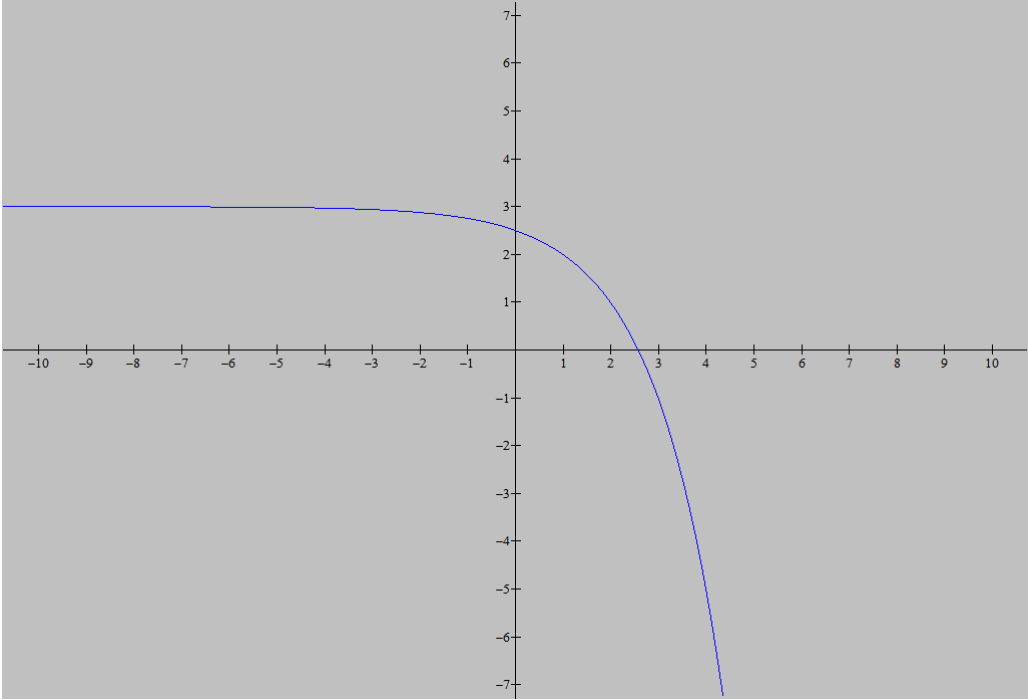[a] $7^x = 3$ [b] $6^{x-2} = 4^{x+1}$

[11]   The number of bacteria in a colony is given by $B(t) = 1.3(2.1)^t$.

       [a]   How many bacteria were there at time $t = 4$? Round your answer to 1 decimal place.
       [b]   At what time were there at least 41 bacteria ? Round your answer to 2 decimal places.

[12]   [a]   Find the intensity (in microns) of an earthquake with a Richter magnitude of 5.6.
       [b]   Find the Richter magnitude of an earthquake of intensity 56,000,000 microns.

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Midterm 3 Review Answers

[1]   [a]   all real numbers   [b] $\{x > 0\}$

[2]   [a] $\{y > 0\}$ [b]   all real numbers

[3]   [a] $\dfrac{1}{2}$ [b] -2 [c]   3   [d]   UNDEFINED

    [e]   UNDEFINED   [f]   0   [g]   6   [h]   4

    [i]   6   [j] -3 [k]   7   [l]   UNDEFINED

    [m]   UNDEFINED   [n]   5

[4]   [a] -2 [b]   3   [c]   11   [d] -5

    [e]   5   [f]   7

[5]   [a] $\log 40$ [b] $\log 7$ [c] $\log 32$ [d] $\log x^3 y^2$

    [e] $\log \dfrac{x^2 z}{y}$ [f] $\log \dfrac{z}{y^2 x}$ [g] $\log \dfrac{y^2 z^3}{x}$ [h] $\log z^4 xy^3$

[6]   [a] $\log 7 + \log 11$ [b] $\log 13 - \log 5$ [c] $8 \log 3$ [d] $4 \log r + \log s$

    [e] $5 \log a - 2 \log b$ [f] $\log m - 2 \log n - 3 \log p$

    [g] $2 \log x - \dfrac{1}{2} \log y - \dfrac{1}{2} \log z$

[7]   [a]-[ii]   [b]-[i]   [c]-[iv]   [d]-[v]

    [e]-[i]   [f]-[ii]   [g]-[ii]   [h]-[i]

    [j]-[i]   [k]-[iii]   [m]-[iii]   [n]-[i]

[8]   [b]

[9]

[10]   [a]   0.5646

    [b]   12.2571

[11]   [a]   25.3 bacteria   [b]   4.65 units of time

[12]   [a]   398107 microns   [b]   7.748