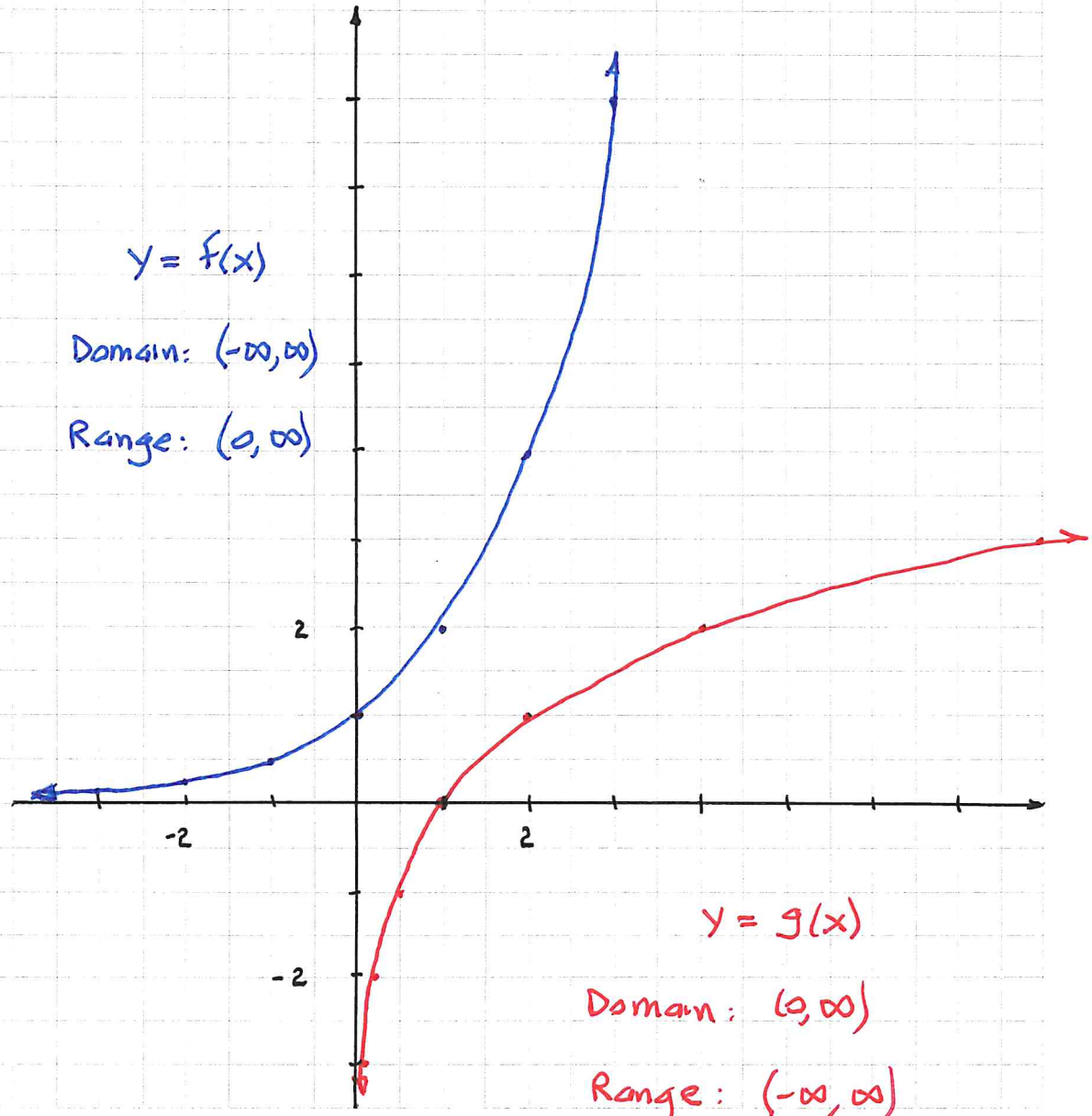
Exponential and Logarithm Function Review

Let $f(x) = 2^x$

and $g(x) = \log_2 x$

$f(x)$	
-3	$\frac{1}{8}$
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4
3	8
4	16

$g(x)$	
$\frac{1}{8}$	-3
$\frac{1}{4}$	-2
$\frac{1}{2}$	-1
1	0
2	1
4	2
8	3
16	4



Properties:

$g(2 \cdot 4) = g(8) = 3$ $\qquad \log_2(8)$

$g(2) + g(4) = 1 + 2 = 3$

$g(32) = g(2 \cdot 16) = g(2) + g(16) = 1 + 4 = 5$ $\qquad \log_2(32)$

$g\left(\frac{16}{4}\right) = g(4) = 2$ ✓ $\qquad \log_2(4) = 2$

$g(16) - g(4) = 4 - 2 = 2$ ✓

$g(4^2) = g(16) = 4$ ✓

$2 \cdot g(4) = 2 \cdot 2 = 4$ ✓

Math 27 Logarithm Properties Worksheet (Pg. 1) Section 3.3

Expand and Simplify, if possible :

① $\log_3 (9 \cdot a^2) = \log_3 9 + \log_3 a^2 = 2 + 2\log_3 a$

② $\ln\left(\frac{a^3 b^2}{c}\right) = \ln(a^3 \cdot b^2) - \ln c = \ln a^3 + \ln b^2 - \ln c = 3\ln a + 2\ln b - \ln c$

③ $\log_5 \sqrt[3]{x^4 y^5} = \log_5 (x^4 y^5)^{1/3} = \frac{1}{3}\log_5(x^4 \cdot y^5) = \frac{1}{3}\left[4\log_5 x + 5\log_5 y\right]$

④ $\log\left(\frac{x^2}{y^3 z}\right) = \log x^2 - \log(y^3 z) = 2\log x - (3\log y + \log z)$

⑤ $\log_a (12 x^3 \sqrt{y}) = \log_a 12 + 3\log_a x + \frac{1}{2}\log_a y$

⑥ $\log_{12}\left(\frac{x-7}{x+2}\right) = \log_{12}(x-7) - \log_{12}(x+2)$

Math 27 Logarithm Properties Worksheet (Pg. 2) Section 3.3

Condense and Simplify:

⑦ $2\log x + \frac{1}{2}\log y = \log x^2 + \log y^{1/2} = \log(x^2 \cdot y^{1/2})$

⑧ $\frac{1}{2}\log_5 100 - \log_5 2 = \log_5 \cancel{100}^{\,1/2}_{10} - \log_5 2 = \log_5\left(\frac{10}{2}\right) = \log_5 5 = 1$

⑨ $4\ln x + 3\ln y + 2\ln z + 1 = \ln(x^4 y^3 z^2) + 1$

⑩ $2\log x + 3\log(x+1) = \log[x^2(x+1)^3]$

⑪ $\frac{1}{3}\log_3(x+1) - \frac{1}{3}\log_3(x-1) = \frac{1}{3}[\log_3(x+1) - \log_3(x-1)] = \log_3\left[\frac{x+1}{x-1}\right]^{1/3}$

⑫ $\log_6\left(\frac{1}{4}\right) + \log_6\left(\frac{4}{5}\right) + \log_6\left(\frac{5}{6}\right) = \log_6\left(\cancel{\frac{1}{4}}\cdot\cancel{\frac{4}{5}}\cdot\cancel{\frac{5}{6}}\right) = \log_6\left(\frac{1}{6}\right) = -1$