Evaluate the following without a calculator.

1. $\log_6 1 = \boxed{0}$
   $6^? = 1$

2. $\log_3 81 = \boxed{4}$
   $3^? = 81$

3. $\log_6 \frac{1}{\sqrt[5]{36}} = \boxed{-\frac{2}{5}}$
   $\log_6 6^{-2/5}$

4. $\ln e^{-4} = \boxed{-4}$

5. $\ln \frac{1}{\sqrt{e^7}} = \boxed{-\frac{1}{7}}$

6. $5^{\log_5 8} = \boxed{8}$

7. $10^{\log 14} = \boxed{14}$

8. $e^{\ln \frac{1}{5}} = \boxed{\frac{1}{5}}$

U3LT1 - **I can identify properties of an exponential and logistic function and I can graph them.**

Graph the following function and give the necessary information.

9. $f(x) = 2\left(\frac{1}{3}\right)^x + 1$

x	y
-2	19
-1	7
0	3
1	$1\frac{2}{3}$
2	$1\frac{2}{9}$

Domain: $(-\infty, \infty)$

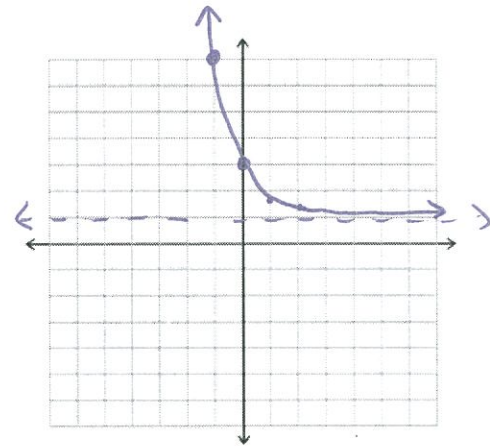Range: $(1, \infty)$

y Intercept: $(0, 3)$

x Intercept: None

Asymptotes: $y = 1$

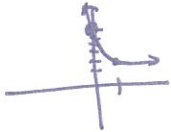End Behavior Limits: $\lim\limits_{x \to \infty} f(x) = 1$, $\lim\limits_{x \to -\infty} f(x) = \infty$

Intervals of Increase: None

Intervals of Decrease: $(-\infty, \infty)$

10. Find the equation of the exponential function where $f(0) = 6$ and $f(1) = 2$. Then, evaluate $f(-1)$.

x	y
0	6
1	2
2	$\frac{2}{3}$

Decay $\times \frac{1}{3}$, $\times \frac{1}{3}$

$\boxed{f(x) = 6\left(\frac{1}{3}\right)^x}$ $\boxed{f(-1) = 18}$

moved y-int.

11. Find the equation of the exponential function where $f(0) = 12$ and $f(2) = 3$. Then, evaluate $f(1)$.

x	y
0	12
2	3

$\leftarrow (1, 6)$

$\boxed{f(x) = 12\left(\frac{1}{2}\right)^x}$

$\boxed{f(1) = 6}$

U3LT2 - **I can identify properties of a logarithmic function and I can graph them.**

Graph the following

12. Write the equation of the graph given the parent function $f(x) = \log_3 x$ with the following transformations:
   - Vertical stretch of five
   - Translated two units to the left
   - Translated three units down

   $\boxed{f(x) = 5\log_3(x+2) - 3}$

Graph:

13. $f(x) = -3\log_2(x+1)$

Domain: <u>Don't do</u>

Range: Work on problems from worksheet

y Intercept:

x Intercept:

Asymptotes:

End Behavior Limits:

Intervals of Increase:

Intervals of Decrease:

$f(x) = \log_{\frac{1}{2}}(x+1)^3$

$\frac{1}{2}^y = (x+1)^3$

$3\sqrt{\frac{1}{2}^y} = x+1$

$\log_2 x$
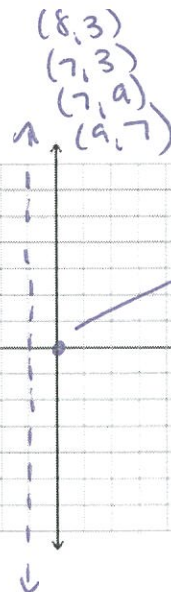
x	y
0	1
4	2
8	3

↑
Difficult to do with table
(but possible!)

Think about transformations.
• Decay   • Left 1
• V. Stretch by 3

(1,0)
(0,0) Left 1
(0,0) Stretch 3
(0,0) reflect

(4,2) #
(3,2) S
(3,6) R
(6,3)

(8,3)
(7,3)
(7,9)
(9,7)

U3LT3 - I can apply properties of logarithms and exponents to simplify expressions.

Write in terms of log with base 10.

14. $\log_5 31$ $\dfrac{\log_{10} 31}{\log_{10} 5}$

Don't do

Expand

15. $\log_5 \dfrac{125}{\sqrt{x^2 y}}$

$\log_5 125 - \log_5 \sqrt{x^2 y}$

$\log_5 125 - \frac{1}{2}\log_5 x^2 y$

$\log_5 125 - \frac{1}{2}(2\log_5 x + \log_5 y)$

Simplify the following

16. $\log_7(\log_7 7) - \log_7 \frac{1}{7}$

$\log_7 \frac{1}{7}$

$\log_7 7 = \boxed{1}$

1

$\log_7(1) - \log_7 \frac{1}{7}$

Condense the following

17. $3\log x - \log xy$

$\log x^3 - \log xy = \log \dfrac{x^3}{xy} = \boxed{\log \dfrac{x^2}{y}}$

Simplify completely and show all work:

18. $11^{\frac{1}{2}\log_{11} 25 + 2\log_{11} 3}$

$11^{\log_{11} 25^{1/2} + \log_{11} 3^2}$

$11^{\log_{11} 5 + \log_{11} 9}$

$11^{\log_{11} 45}$

$\boxed{45}$

Expand the following

19. $\log\left(\dfrac{x}{y^2}\right)^3$

$3\log\left(\dfrac{x}{y^2}\right)$

$3(\log x - \log y^2)$

$3(\log x - 2\log y)$

Expand the following

20. $\log(xy)^6$

$6\log xy$

$6(\log x + \log y)$

Condense the following

21. $\dfrac{\log x}{2}$ $\boxed{\log \sqrt{x}}$

Expand the following

22. $\log_3 \dfrac{x^2 y^4}{3z}$

$\log_3 x^2 y^4 - \log_3 3z$

$\boxed{2\log_3 x + 4\log_3 y - \log_3 3z}$

Condense the following

23. $\log_6 4 + \log_8 2 - \log_6 3$

$\log_6 \frac{4}{3} + \log_8 2$

OR $\boxed{\log_6 \frac{4}{3} - 3}$