Review Unit 3
Honors Pre-Calc

NO CALCULATOR

Name Key

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

1. Graph and state the following: $f(x) = 2\left(\frac{1}{4}\right)^x - 3$

$3 = 2\left(\frac{1}{4}\right)^x$

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

Range: $(-3, \infty)$

y Intercept: $(0, -1)$

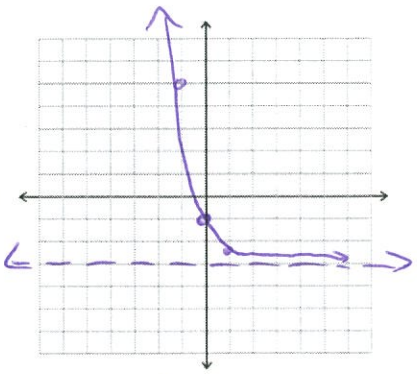
~~x Intercept:~~ Don't do

Asymptotes: $y = -3$

End Behavior Limits: $\lim_{x\to\infty} f(x) = -3$, $\lim_{x\to-\infty} f(x) = \infty$

Intervals of Increase: None

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



x	y
-2	29
-1	5
0	-1
1	-2.5

2. Write the function of the exponential graph that goes through f(0)= 3 and f(2) = 9

x	y
0	3
2	9

$\times 3$

$y = ab^x$

$y = 3b^x$

$9 = 3b^2$

$3 = b^2$

$b = \sqrt{3}$

$y = 3(\sqrt{3})^x$

3. Graph and state the following: $f(x) = \frac{5}{2+2(3)^x}$ Logistic Function

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

Range: $(0, 5/2)$

y Intercept: $(0, 5/3)$

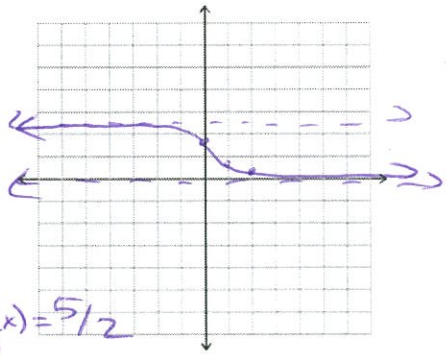
x Intercept: None

Asymptotes: $y = \frac{5}{2}$, $y = 0$

End Behavior Limits: $\lim_{x\to\infty} f(x) = 0$, $\lim_{x\to-\infty} f(x) = 5/2$

Intervals of Increase: N/A

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



x	y
-1	15/8
0	5/3
1	5/8
2	5/20 = 1/4

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

4. Graph and state the following: $y = 2\log(x-3) - 4$

Right 3 Stretch 2 Down 4

Domain: $(3, \infty)$ Range: $(-\infty, \infty)$

y Intercept: None x Intercept: $(103, 0)$

Asymptotes: $x = 3$

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

Intervals of Increase: $(3, \infty)$

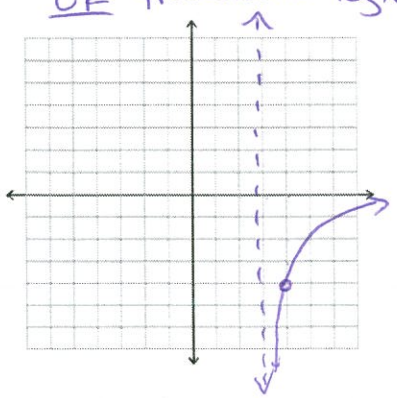
Intervals of Decrease: None

x	y
13	-2
103	0
4	-4

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

$10^{\frac{y+4}{2}} + 3 = x$

OR transform $\log x$



5. Create the transformation from the parent graph of $y = lnx$:

a.) Shift up 8, right 3, vertical stretch of 4 and reflection of the x axis.

$y = -4\ln(x-3)+8$

b.) Left 6, vertical shrink of ½ and down 2

$y = \frac{1}{2}\ln(x+6)-2$

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

Simplify.

6. $\log_{12} 6$ — $\log_{36} 6 = \frac{1}{2}$

7. $\ln \frac{e}{\sqrt{10}}$ — ignore — $= \ln e \cdot 10^{-1/2}$ — $\ln e + \ln 10^{-1/2}$ — $1 + -\frac{1}{2}\ln 10$

8. $2^{\frac{1}{3}\log_2 8 - 2\log_2 4}$ — $\log_2 \sqrt[3]{8} - \log_2 16$ — $= 2^{\log_2 \frac{\sqrt[3]{8}}{16}} = \frac{\sqrt[3]{8}}{16} = \frac{1}{8}$

Write each logarithmic expression as a single logarithm.

9. $6^{\frac{1}{2}\log_6 36 - 2\log_6 1}$ — $= 6^{\log_6 6 - \log_6 1}$ — $= 6^{1-0} = 6$

10. $\log a - \log ab$ — $\log \frac{a}{ab} = \log \frac{1}{b}$

11. $3\log 2x + 5\log x$ — $= \log(2x)^3 + \log x^5$ — $= \log 8x^3 \cdot x^5 = \log 8x^8$

Expand each logarithm.

12. $\log_7 \frac{23}{4}$ — $\log_7 23 - \log_7 4$

13. $\log_2 \sqrt{\frac{4x}{3y}}$ — $\frac{1}{2}\log_2\left(\frac{4x}{3y}\right) =$ — $= \frac{1}{2}\log_2 4x \cdot \frac{1}{2}\log_2 3y$ — $= \frac{1}{2}\log_2 4 + \frac{1}{2}\log_2 x - \frac{1}{2}\log_2 3 - \frac{1}{2}\log_2 y$

14. $\log_6 \frac{s^4}{36}$ — $= \log_6 s^4 - \log_6 36$ — $= 4\log_6 s - 2$

CALCULATORS ARE ALLOWED

U3LT4 - I can apply properties of exponents and logarithms to solve equations.

Solve each equation. Round to 4 decimals places.

15. $8 - 3^x = -1$ — $3^x = 9$ — $x = 2$

16. $\log_3 81 = x$ — $x = 4$

17. $\ln(2x-5) = 3$ — $e^3 = 2x-5$ — $25.0855 = 2x$ — $x = 12.5428$

18. $3e^{-2x} + 5 = 14$ — $3e^{-2x} = 9$ — $e^{-2x} = 3$ — $\ln 3 = -2x$ — $x = -.5493$

19. $2\log x - \log 4 = 2$ — $\log x^2 - \log 4 = 2$ — $\log \frac{x^2}{4} = 2$ — $10^2 = \frac{x^2}{4}$ — $400 = x^2$ — $x = 20$

20. $\frac{1}{3}\log_2 27 + \log_2 5x = \log_2(x+7)$ — $\log_2 27^{\frac{1}{3}} + \log_2 5x = \log_2(x+7)$ — $15x = x+7$ — $14x = 7$ — $x = 1/2$

U3LT5 - **I can apply my knowledge of exponential and logarithmic functions to investigate real world applications**

21. You put $2000 into an account earning 4% interest compounded quarterly. Find the amount in the account at the end of 8 years.

$A = 2000\left(1 + \frac{.04}{4}\right)^{4 \cdot 8} = 2000(1.01)^{32} = \$2749.88$

22. Gold-198 has a half-life of 2.7 days. How much of a 96 g sample of gold-198 will be left after 8.1 days?

$8.1 \div 2.7 = 3$ half lives

$A = 96(0.5)^3$

$A = 12$ grams

23. Wanting to buy Cubs World Series tickets you withdrew ~~$4,320 from a~~ compound continuous interest account that you invested $3,500 ten years ago. Find the rate at which interest was earned.

$A = Pe^{rt}$ Solve for r

$4320 = 3500e^{r(10)}$

$\ln\left(\frac{4320}{3500}\right) = 10r \quad r = .123$ or 12.3%

U3LT6 - **I can investigate a scenario and create a regression model that best fits the data whether it be linear, exponential, or logarithmic.**

Speed (mph)	10	20	30	40	50
Stopping Distance(feet)	15.1	39.9	75.2	120.5	175.9

24.9 35.3 45.3 55.4

24. (a) Determine which type of regression is the best fit for this data.

Exponential growth

(b) Find the regression equation for the data. (Round to the 1,000th)

$Y = 10.2969 \cdot 1.0620^x$

(c) Use your equation to estimate the number of feet needed to stop the car if traveling 80 mph.

$Y = 10.2969 \cdot 1.0620^{80}$

$Y = 1266.6827$ ft

(d) At what ~~time~~ mph will the stopping distance be 28 feet?

$28 = 10.2969 \cdot 1.0620^x$

$2.7193 = 1.0620^x$

$x = 16.63$ mph