Honors Algebra 2 — Unit 6 - Exponentials and Logarithms

Name _____ Date _____

1. Rewrite as a log:

$\left(\frac{1}{4}\right)^{-3} = 64$

$\log_{\frac{1}{4}} 64 = -3$

2. Rewrite as an exponential

$\log_5\left(\frac{1}{125}\right) = h$

$5^h = \frac{1}{125}$

3. Expand $\log_4 \frac{16d^5}{b^4c^3}$

$2 + 5\log_4 d - 4\log_4 b - 3\log_4 c$

4. Expand $\ln y^4 \sqrt[3]{y+2}$

$4\ln y + \frac{1}{3}\ln(y+2)$

5. Condense

$4\ln b - \ln 7 - \ln g - 5\ln j$

$\ln \frac{b^4}{7gj^5}$

6. Condense

$\log_6 2 - \frac{1}{3}\log_6(x+3) - 4\log_6 y$

$\log_6 \frac{2}{y^4\sqrt[3]{x+3}}$

7. Solve

$11(4^{x+2}) - 18 = 1082$

$\log_4 4^{x+2} = \log_4 100$

$x + 2 = 3.3219...$

$x = 1.322$

8. Solve

$\log_5(6x+1) = \log_5(3x+16)$

$6x + 1 = 3x + 16$

$3x = 15$

$x = 5$

9. Solve

$-3e^{4x} - 7 = -40$

$\ln e^{4x} = \ln 11$

$4x = \ln 11$

$x = .599$

10. Solve

$12 - 3\ln(2x) = 6$

$e^{\ln(2x)} = e^2$

$2x = e^2$

$x = 3.695$

11. Solve *condense*

$\log_6 x + \log_6(x+5) = 2$

$6^{\log_6 x(x+5)} = 6^2$

$x^2 + 5x = 36$

$x^2 + 5x - 36 = 0$

$(x+9)(x-4)$

$x = 4$

12. Solve *same base*

$1296^{x-1} = 6^{x-1}$

$(6^4)^{x-1} = 6^{x-1}$

$4x - 4 = x - 1$

$3x = 3$

$x = 1$

*Round to 3 Decimals! *

13. You purchase a car for $27,000. The value of the car decreases 10% each year. $r = .10$

a. Write the equation for the car's value in terms of the number of years since the purchase.

$A = 27{,}000(1 - .10)^t$

b. What is the value of the car after 4 years?

$A = 27{,}000(.90)^4 = \$17{,}714.70$

c. When will the car be worth half the original value?

$13{,}500 = 27{,}000(.90)^t$

$\log_{.90} .5 = \log_{.90} .90^t$

$t = 6.579$ years

14. You deposit $5100 in an account that earns 4.5% annual interest. Find the balance after 10 years if the interest is compounded: .045

a. Semi-Annually

$A = 5{,}100\left(1 + \frac{.045}{2}\right)^{2 \cdot 10}$

$A = \$7{,}958.60$

b. Quarterly

$A = 5{,}100\left(1 + \frac{.045}{4}\right)^{4 \cdot 10}$

$A = \$7{,}978.32$

c. Continuously

$A = 5100e^{.045(10)}$

$A = \$7{,}998.39$

b. How long would it take to double your investment if it is compounded continuously?

$10{,}200 = 5100e^{.045t}$

$\ln 2 = \ln e^{.045t}$

$\ln 2 = .045t$

$t = 15.403$ years

Find the Domain, Range, and Asymptote of each function

15. $f(x) = \log_3(x-3) + 2$

Domain: $(3, \infty)$

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

Asymptote: $x = 3$

16. $f(x) = -3^{x-2} + 7$

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

Range: $(-\infty, 7)$

Asymptote: $y = 7$

17. $h(x) = \ln(3x-4) - 5$

Domain: $(4/3, \infty)$

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

Asymptote: $x = 4/3$

18. $g(x) = -2^{x-2} - 3$

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

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

Asymptote: $y = -3$

Describe the Transformation in each function

19. $f(x) = \log_4(-x-1) - 2$

- Reflect y-axis
- Left 1
- Down 2

20. $f(x) = -2^x - 1$

- Reflect x-axis
- Down 1

State whether the function is increasing or decreasing *State the interval of inc/dec

21. $f(x) = -2^x - 5$

Interval is your Domain!!

Decreasing $(-\infty, \infty)$

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

Increasing $(-\infty, \infty)$

23. A) Is the table below an exponential function or a logarithmic function?

exponential

B) Does the function have a vertical or horizontal asymptote?

y=

C) What is the equation of the **asymptote**?

X	F(x)
-2	2.33333
-1	3
0	5
1	11
2	29

order

$y = 2$

24. A) Is the table below an exponential function or a logarithmic function?

log

B) Does the function have a vertical or horizontal asymptote?

x=

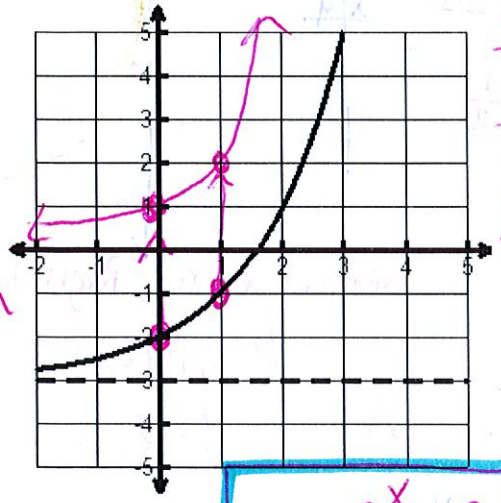
C) What is the equation for the **asymptote**?

X	F(x)
1.5	-0.631
2	0
4	1
10	2

order

$x = 1$

25. What is the **equation of the function** graphed below?



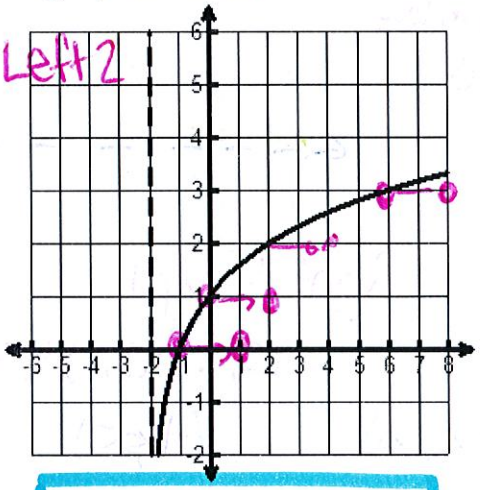
new

x	y
0	1
1	2

Down 3

$y = 2^x - 3$

26. What is the **equation of the function** graphed below?



Left 2

new

x	y
1	0
2	1
4	2

$y = \log_2(x+2)$

Find the Inverse of the Functions Below

22. $y = 3^{x+1} - 4$

$x = 3^{y+1} - 4$

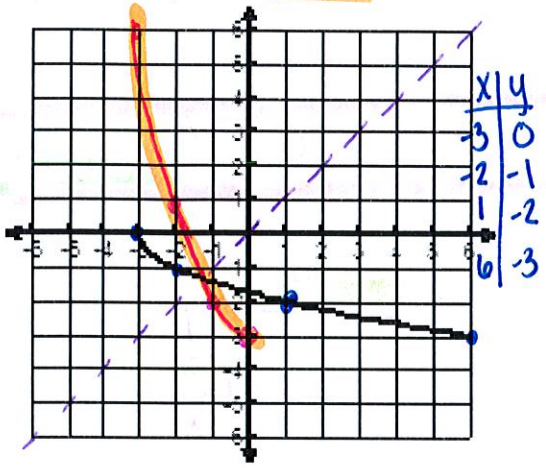
$y^{-1} = \log_3(x+4) - 1$

23. $y = \log_2(x-1)$

$x = \log_2(y-1)$

$f^{-1}(x) = 2^x + 1$

27. Graph the inverse

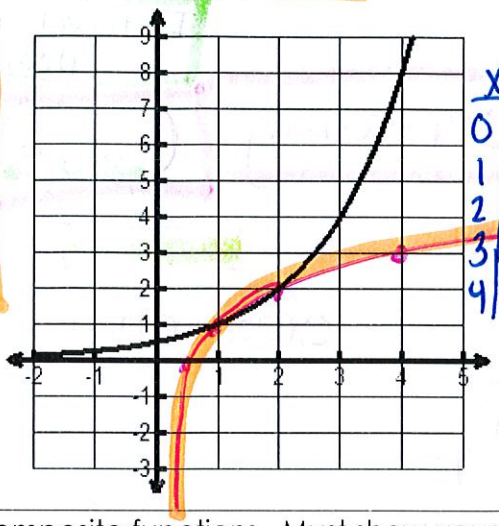


x	y
-3	0
-2	-1
1	-2
6	-3

→

x	y
0	-3
-1	-2
-2	1
-3	6

28. Graph the inverse



x	y
0	.5
1	1
2	2
3	4
4	8

→

x	y
.5	0
1	1
2	2
4	3
8	4

29. Prove whether the functions INVERSES using composite functions. Must show your work!

$f(x) = 3x - 2$

$g(x) = \frac{x+2}{3}$

$f(g(x)) = 3\left(\frac{x+2}{3}\right) - 2$

$= x + 2 - 2$

$= x$ ✓

$g(f(x)) = \frac{(3x-2)+2}{3}$

$= \frac{3x}{3} = x$ ✓

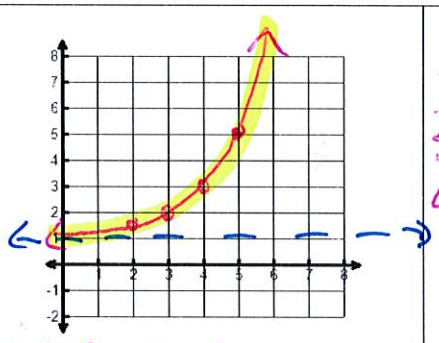
yes, inverses

30. $y = 2^{x-3} + 1$

2nd Window

Start @ 0

ΔTbl : 1



x	y
0	1 dec
order	2 whole

Transformations Right 3, up 1

State 3 points on Graph (2, 1.5)(3, 2)(4, 3)

Domain $(-\infty, \infty)$ Range $(1, \infty)$

Asymptote $y = 1$

X-intercept none Y-intercept (0, 1.125)

Increasing or Decreasing

End Behavior: $x \to -\infty, f(x) \to 1$; $x \to \infty, f(x) \to \infty$

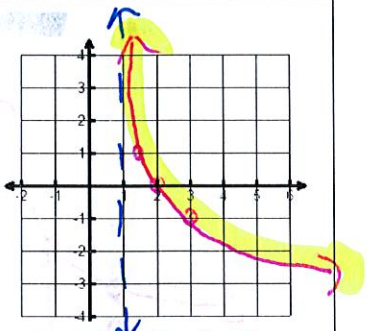
31. $y = -\log_2(x-1)$

2nd Window

Start @ 1

ΔTbl : $\frac{1}{2}$

x	y
→ 1 dec	0
→ 2 whole	1
order	



Transformations Reflect x-axis, Right 1

State 3 points on Graph (1.5, 1)(2, 0)(3, -1)

Domain $(1, \infty)$ Range $(-\infty, \infty)$

Asymptote $x = 1$

X-intercept (2, 0) Y-intercept none

Increasing or Decreasing

End Behavior: $x \to 1, f(x) \to \infty$; $x \to \infty, f(x) \to -\infty$