Chapter 8 Practice Test Name KEY

Adv. Algebra

For each of the following problems, ***show work or receive no credit.***

1. A new truck that sells for $34,000 depreciates 12% each year. Write a function that models the value *y* of the truck after *t* years. Then find the value of the truck after 6 years.

$a(1 - \text{rate})^t$

Function: $f(t) = 34{,}000(1-.12)^t$ (or $y = 34{,}000(.88)^t$) Amount after 6 years: $15,789.74

2. The dolphin population increases at a rate of 3.5% per year. There are 1954 dolphins this year. Write a function that models the population of dolphins, *y,* after *t* years. How many dolphins will there be in 8 years?

$a(1 + \text{rate})^t$

Function: $f(t) = 1954(1+.035)^t$ Dolphins in 8 years: ≈ 2,573 dolphins

3. An investment of $75,000 increases at a rate of 4.25% compounded continuously. Find the value of the investment after 30 years.

$75{,}000\, e^{(.0425 * 30)}$

principle, rate, time: Pe^{rt}

Value of investment after 30 years: $268,402.61

4. Kevin has $800 to invest in an account that compounds interest continuously at an annual rate of 4%. How long will it take him account to grow to $1500? (Round to the nearest tenth of a year.)

ending, initial

$$\frac{1500}{800} = \frac{800\, e^{.04t}}{800}$$

$$\ln\frac{15}{8} = \ln e^{.04t}$$

$$\frac{\ln\frac{15}{8}}{.04} = \frac{.04t}{.04}$$

$$15.72 \approx t$$

Time to grow account to $1500: 15.7 years ... almost 16 years

Graph each exponential function. State the domain, range, asymptote, and transformations from the parent graph. Show at least three points and the asymptote in the graph.

5. $y = -(2)^{x-1} - 2$ → exp. growth ... in a negative direction

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

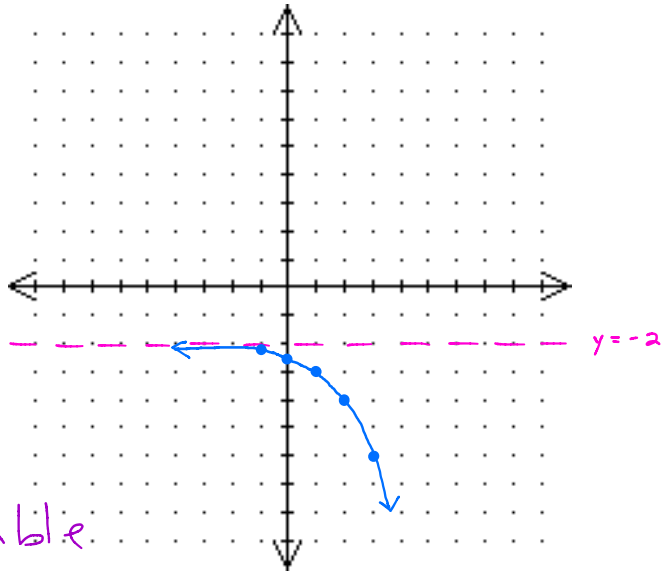
Range: $(-\infty, -2)$

Asymptote: $y = -2$

Transformations: ① Reflect over x-axis

② Horizontal Shift Right 1

③ Vertical Shift Down 2



Table

Right 1 (add 1)	x	2^x y	Reflect (mult by -1)	Down 2 (sub. 2)
-1	-2	$\frac{1}{4}$	$-\frac{1}{4}$	$-2\frac{1}{4}$
0	-1	$\frac{1}{2}$	$-\frac{1}{2}$	$-2\frac{1}{2}$
1	0	1	-1	-3
2	1	2	-2	-4
3	2	4	-4	-6

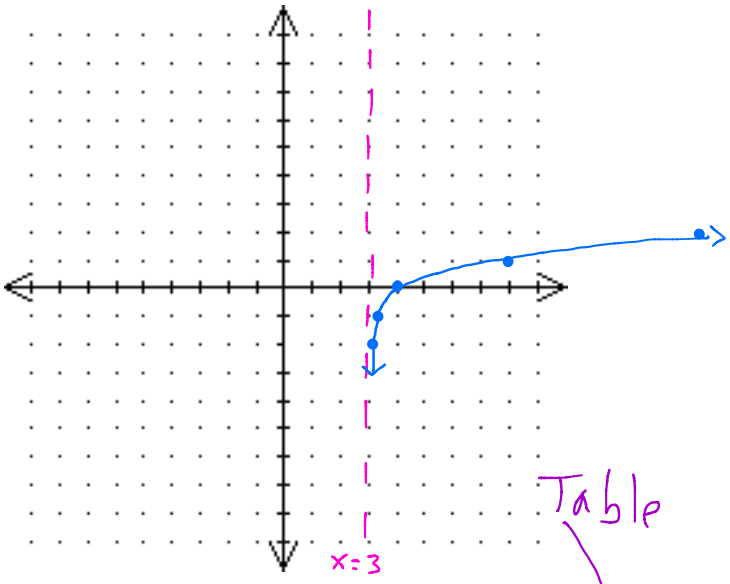
6. $y = \log_5(x - 3)$

Domain: $(3, \infty)$

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

Asymptote: $x = 3$

Transformations: ① Horizontal Shift Right 3



Table

5^y

Right 3 (Add 3)	x	y
$3\frac{1}{25}$	$\frac{1}{25}$	-2
$3\frac{1}{5}$	$\frac{1}{5}$	-1
4	1	0
8	5	1
28	25	2

Plug in for y

7. The parent function for a graph is $y = 3(2)^x$. In writing, explain the transformations you do to the parent graph to graph $y = -3(2)^{x-3} + 2$.

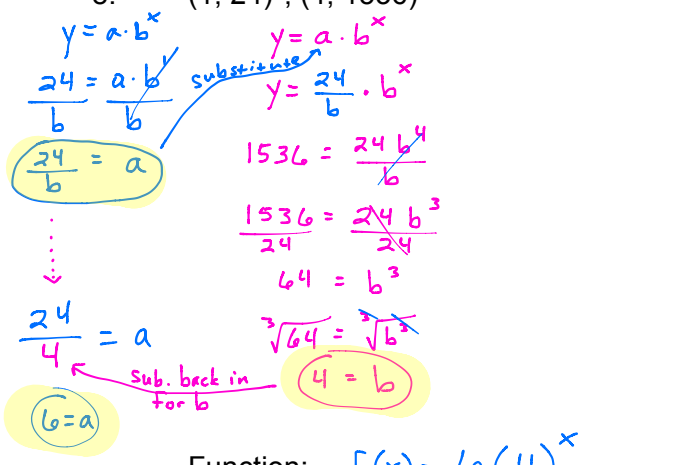
Reflect over x-axis

Horizontal Shift Right 3

Vertical Shift Up 2

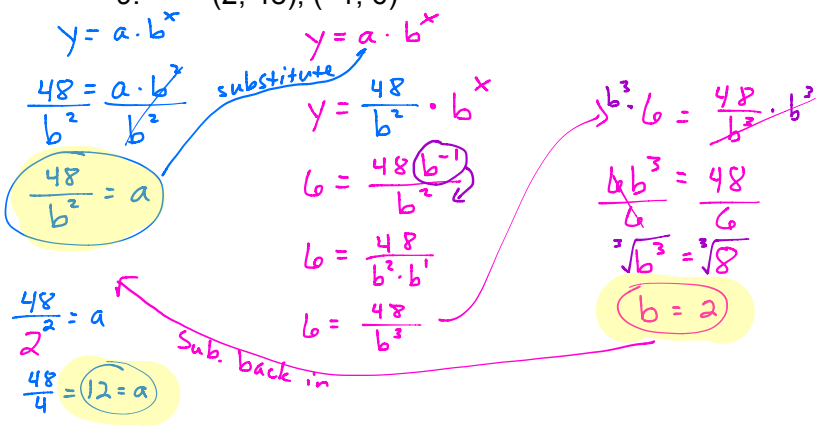
Write an exponential function $y = ab^x$ for a graph that includes the given points. ***Show work or receive no credit***.

8. (1, 24) , (4, 1536)



Function: $f(x) = 6(4)^x$

9. (2, 48), (–1, 6)



Function: $f(x) = 12(2)^x$

Write each equation in exponential form.

10. $\log_{12} \frac{1}{144} = -2$

Exponential form: $12^{-2} = \frac{1}{144}$

Evaluate each logarithm. (Do not use change of base or a calculator.)

11. $\log_4 16$

$4^{?} = 16$

Evaluation: 2

13. ~~ln~~ e^2 or $\ln \Rightarrow \log_e$

2 $\log_e e^2$

2

Evaluation: 2

★ 12. $\log_9 \frac{1}{3}$

$9^x = \frac{1}{3}$

$3^{2x} = \frac{1}{3}$

$3^{2x} = 3^{-1}$

$\frac{2x}{2} = \frac{-1}{2}$

$x = -\frac{1}{2}$

Evaluation: $-\frac{1}{2}$

Expand the following logarithms.

14. $\log_5 \frac{2x^6}{3}$

$\log_5(2\cdot x^6) - \log_5 3$

$\log_5 2 + \log_5 x^6 - \log_5 3$

Expansion: $\log_5 2 + 6\log_5 x - \log_5 3$

15. $\log \frac{5\sqrt{x}}{y^3}$

$\log 5\cdot\sqrt{x} - \log y^3$

$\log 5 + \log\sqrt{x} - \log y^3$

$\log 5 + \log x^{\frac{1}{2}} - \log y^3$

Expansion: $\log 5 + \frac{1}{2}\log x - 3\log y$

Condense the following logarithmic expressions.

16. $\frac{1}{3}\log 5 - 2\log y + 3\ln z$

$\left(\log 5^{\frac{1}{3}} - \log y^2\right) + \log z^3$

$\log \frac{\sqrt[3]{5}}{y^2} + \log z^3$

$\log\left(\frac{\sqrt[3]{5}}{y}\cdot z^3\right)$

Condensing: $\log\left(\frac{\sqrt[3]{5}\,z^3}{y}\right)$

17. $2\log_3 x$

$\log_3 x^2$

Condensing: $\log_3 x^2$

Solve the equation. Round to two decimal places. ***Show work or receive no credit***.

18. $\log x + \log 4 = 2$

$\log(x\cdot 4) = 2$

$\log_{10} 4x = 2$

$10^2 = 4x$

$\frac{100}{4} = \frac{4x}{4}$

$25 = x$

Solution(s): $x = 25$

20. $4^{3x-1} - 2 = 10$

$+2 \quad +2$

$\log_4 4^{3x-1} = \log_4 12$

$3x - 1 = \log_4 12$

$+1 \quad +1$

$\frac{3x}{3} = \frac{\log_4 12 + 1}{3} \approx \frac{2.79}{3} \approx .93$

Solution(s): $x \approx .93$

19. $\frac{3\log 2x}{3} = \frac{4}{3}$

$\log_{10} 2x = \frac{4}{3}$

$\frac{2x}{2} = \frac{10^{\frac{4}{3}}}{2} \approx 10.77$

Solution(s): $x \approx 10.77$

21. $\frac{4\ln(8x+1)}{4} = \frac{12}{4}$

$\ln(8x+1) = 3$

$\log_e 8x+1 = 3$

$e^3 = 8x+1$

$-1 \quad -1$

$\frac{e^3 - 1}{8} = \frac{8x}{8}$

$x = \frac{e^3-1}{8} \approx \frac{19.09}{8} \approx 2.39$

Solution(s): $x \approx 2.39$