

Algebra 2  
Exponential Review

Name:  
Date:

**Use separate paper.**

1. Evaluate each expression without using a calculator.

a.  $4^{-2} =$                       b.  $(-3)^{-1} =$                       c.  $\left(\frac{1}{5}\right)^{-3} =$                       d.  $49^{1/2} =$   
e.  $64^{-1/3} =$                       f.  $\left(\frac{9}{16}\right)^{3/2} =$                       g.  $-7^0 =$                       h.  $(3)(2)^2 =$   
i.  $(.6^{-2})^{-1/2} =$

2. Determine whether each equation is true or false. If false, explain the mistake and rewrite one side of the equation to make it true. Check your answer on the calculator.

a.  $\log 3 + \log 7 = \log 21$                       b.  $\log 3 + \log 5 = \log 8$   
c.  $\log 16 = 4 \log 2$                       d.  $\log 5 + \log 2 = \log 2.5$   
e.  $\log 9 - \log 3 = \log 6$                       f.  $\log \sqrt{7} = \log \frac{7}{2}$   
g.  $\log 35 = 5 \log 7$                       h.  $\log \frac{1}{4} = -\log 4$   
i.  $\frac{\log 3}{\log 4} = \log \frac{3}{4}$                       j.  $\log 64 = 1.5 \log 16$

3. Solve each equation. Finding the same base on both sides might not be possible. Round to the nearest hundredth when needed.

a.  $800 = 10^x$                       b.  $2048 = 2^x$                       c.  $16 = .5^x$   
d.  $478 = 18.5(10^x)$                       e.  $155 = 24(1.89^x)$                       f.  $19.1(0.21^x) = .0047$   
g.  $x^5 = 3148$                       h.  $(x - 5.1)^4 = 256$                       i.  $69.4 = 7.3x^6 + 14.4$   
j.  $2x + 1 = \sqrt[8]{2432}$                       k.  $4x^{2.7} = 456$                       l.  $734 = 7.2(1.56)^x$   
m.  $147 = 12.1(1 + x)^{2.3}$                       n.  $2\sqrt{x - 3} + 4.5 = 16$

4. Given  $f(x) = (4x - 2)^{1/3} - 1$ , find:

a.  $f(2.5) =$                       b.  $f^{-1}(x) =$                       c.  $f^{-1}(-1) =$

5. Use logarithms to find the zeros of these functions:

a.  $f(x) = 3 \cdot 2^x - 7$                       b.  $f(x) = 2 \cdot 5^{x-2} - 12$   
c.  $f(x) = 2 \log_9(x - 4) + 1$                       d.  $f(x) = \log_7 x^2$

Solve the following word problems. Calculators are OK, but **you should not use calc-intersect**; use logarithms instead.

6. A “learning curve” describes the rate at which a task can be learned. Suppose the equation  $t = -144 \log\left(1 - \frac{N}{90}\right)$  predicts the time  $t$  (in number of daily sessions) it will take to achieve a goal of typing  $N$  words per minute (wpm).

- Using this equation, how long should it take someone to learn to type 40 wpm?
- If the typical person had 47 sessions, what typing speed would you expect them to achieve?
- What domain is realistic for this problem?

7. The population of some town is 12,500. It has been growing at 4% per year and expected to continue to grow at this rate.

- What was its population 6 years ago?
- What do you expect its population to be in 15 years?
- When will its population reach 19,000?
- When was its population 7,500?
- How many years will it take its population to triple?
- Instead of growing at 4% per year going forward, it grew faster. Its population reached 17,000 in 6 years. What was its annual growth rate?

8. How long will it take an investment to double in value if it increases by 15% per year?

9. A population of bacteria doubles every 6 days.

- What is the daily percentage growth rate?
- Using this rate, how long would it take the population to grow from 50 to 600?

10. Value of a car is best modeled by an exponential function because it falls by approximately the same percentage amount each year. A new car is worth \$25,000. Seven years later it is worth \$8,800.

- By what percentage did the car’s value fall each year?
- How old is the car when its value is \$2000?

11. A sweet potato is put in a hot oven. The potato’s temperature (in degrees Fahrenheit) after  $t$  minutes is given by the function  $P(t) = -240 \cdot 0.97^t + 300$ .

- What is the significance of the 300 in the equation?
- Sketch a very rough graph of the potato’s temperature over time. What is a reasonable domain?
- What is the potato’s temperature initially?
- When does the potato’s temperature first hit 200°?
- Write an inequality describing the times that the potato’s temperature will be between 260° and 270°. Use logarithms to solve it (hint: find the times when the temperature equals each endpoint).

12. Find the inverse function of the following functions.

a.  $h(x) = 3 \cdot 2^x - 12$

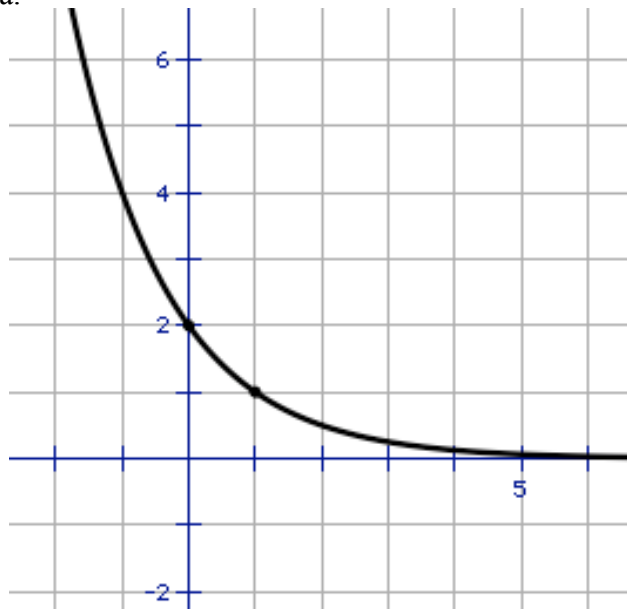
b.  $g(x) = -6 \cdot 5^{x-2} + 10$

c.  $w(x) = 3 \log_{27}(x - 4) + 1$

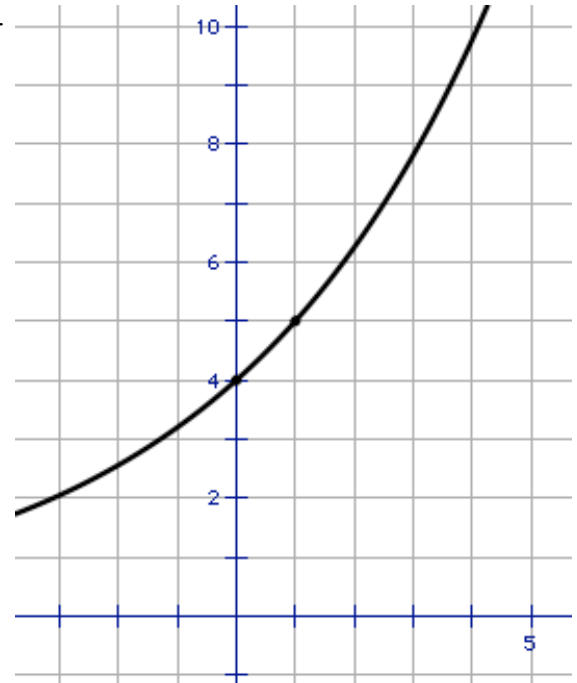
d.  $f(x) = \log_7 x^2$

13. Find the equation of the curves below.

a.



b.



### Answers

5a. 1.22      b. 3.11      c.  $4\frac{1}{3}$       d.  $\pm 1$

7a. 9879      b. 22512      c. 10.68 yrs      d. 13.02 yrs ago      e. 28.01      f.

8. 4.96 yrs

9a. 12.25%      b. 21.5 days

10a. 13.9%      b. 16.9 years

11a. the horizontal asymptote is the oven's temperature.

b.  $t \geq 0$

c.  $P(0) = 60$  degrees

d. after 28.74 minutes

e. between 58.8 mins and 68.3 min