

Algebra 1 • Unit 6 Worksheet

Introduction to Exponential Functions

Name: _____

Date: _____

Part A • Linear vs. Exponential Patterns

1. Two patterns:

a. What's added (or multiplied) at each step for P? For Q?

b. Write equations for $P(x)$ and $Q(x)$.

c. Which grows faster eventually? At $x = 10$, what are P and Q? $P(10) = \underline{\hspace{2cm}}$ $Q(10) = \underline{\hspace{2cm}}$

d. Why does Q eventually overtake P, no matter how steep P's line is?

x	P (linear)	Q (exponential)
0	10	10
1	13	20
2	16	40
3	19	80
4	22	160

Part B • Modeling Exponential Growth and Decay

2. A bacteria population doubles every hour. At time $t = 0$, there are 50 bacteria.

a. Write a function $B(t)$ giving the population at time t (in hours).

b. Find $B(5)$. _____

c. After how many hours will there be MORE than 10,000 bacteria? (Use guess-and-check or graphing.)

d. Why is this model unrealistic forever? What does an exponential model fail to capture?

3. A drug's concentration in the bloodstream decays by 20% each hour. The initial dose is 80 mg.

a. Write a function $D(t)$ for concentration after t hours.

b. What is the DECAY FACTOR? What is the DECAY RATE? Make sure you can tell them apart.

c. Find $D(4)$ and $D(10)$. Round to 1 decimal.

d. Will $D(t)$ ever reach 0 mathematically? Will it in real life? Discuss.

Part C • Equations and Graphs of Exponential Functions

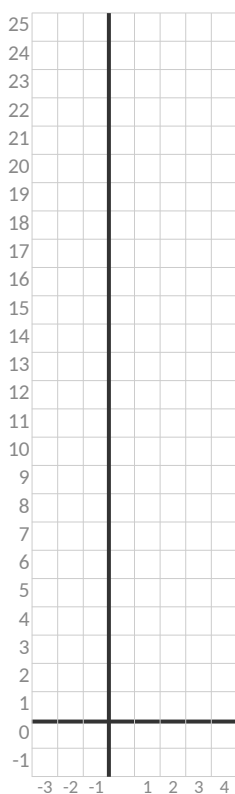
4. Consider $f(x) = 3 \cdot 2^x$.

a. What is the y-intercept of f ? Why?

b. Find $f(1)$, $f(2)$, $f(3)$. _____

c. Find $f(-1)$ and $f(-2)$. What does a NEGATIVE exponent mean here?

d. Sketch f on the grid below. Mark at least 4 points.



5. Match each equation to a description of its graph (growth/decay, where y-intercept is, etc.):

a. $g(x) = 10 \cdot (1/2)^x$:

b. $h(x) = 5 \cdot (3)^x$:

c. $k(x) = 200 \cdot (0.95)^x$:

d. $m(x) = 1 \cdot (1)^x$:

Part D • Compounding and Percent Change

6. A bank offers 6% annual interest, compounded annually. You deposit \$1000.

a. What is your balance after 1 year? After 3 years? Year 1: _____ Year 3: _____

b. Write a function $A(t)$ for your balance after t years.

c. Han argues: "After 10 years, my interest is $6\% \times 10 = 60\% \times \$1000 = \$600$ of interest." Is Han correct? What's the actual interest after 10 years?

d. Why is Han's intuition wrong? Name the concept he is missing.

7. An item is on sale for 20% off, then the cashier gives an additional 10% off the sale price.

a. What is the TOTAL percent discount? Is it 30%? Why or why not?

b. If the original price is \$100, what's the final price? _____

Part E • Constant Ratios and Reasoning

8. A table of values:

a. Compute the RATIO $y(x+1)/y(x)$ for $x = 1, 2, 3$. _____, _____, _____

b. Are these ratios constant? What does this tell you about the function?

c. Write an equation for y as a function of x .

x	y
1	12
2	18
3	27
4	40.5

Part F • Error Analysis and Synthesis

9. Priya wrote: $5^x = 5x$. Mai wrote: $2^3 \cdot 2^4 = 2^{12}$. Diego wrote: $(3^2)^4 = 3^6$. For each, decide whether it is correct. If wrong, give the correct rule with a quick example.

a. Priya: $5^x = 5x$

b. Mai: $2^3 \cdot 2^4 = 2^{12}$

c. Diego: $(3^2)^4 = 3^6$

10. Compare two scenarios.

a. Scenario A: Earn \$1000 per month. Scenario B: Earn 1 cent on day 1, 2 cents on day 2, doubling every day for 30 days. Which is more total money in a month?

b. If you only had to commit to one, which would you choose and why? What feature of exponential growth makes the 1-cent option surprising?
