Comparing Linear, Quadratic, and Exponential Models

Algebra 1 •Section 11.3

Name: _____	Date: _____	Score: _____ / 12

Quick Review and Helpful Hints

Exponential models multiply by a constant factor over equal input intervals. Compare the initial value, multiplier, and long-term behavior before deciding what the model means.

▷ **Example:** Evaluate $100(1.05)^2$.
Work: Square the growth factor: $1.05^2 = 1.1025$. Then multiply: $100(1.1025) = 110.25$.

★ **Answer:** 110.25

Practice Problems

Solve each problem. Show enough work that another student could follow your thinking.

1. Which grows faster eventually: $5x + 20$ or 2^x?

_____

2. Classify $y = 3x + 7$.

_____

3. Classify $y = x^2 - 4$.

_____

4. Classify $y = 6(1.4)^x$.

_____

5. Which has constant second differences?

_____

6. Which has a constant ratio in outputs?

_____

7. Which model has constant first differences?

_____

8. Compare at $x = 3$: $f = x^2$ and $g = 2^x$.

_____

9. Compare at $x = 5$: $f = 3x + 1$ and $g = x^2$.

_____

10. Which model can represent repeated percent growth?

_____

Word Problems

11. A savings account adds $\$50$ monthly. Linear or exponential?

_____

12. A bacteria culture doubles hourly. Linear, quadratic, or exponential?

_____

Answer Keys

1. 2^x
2. Linear
3. Quadratic
4. Exponential
5. Quadratic
6. Exponential
7. Linear
8. $f(3) = 9$ is greater
9. g is greater
10. Exponential
11. Linear
12. Exponential

Step-by-Step Explanations

1. Linear growth adds the same chunk each step, but exponential keeps multiplying — given time, it always wins.
2. The x sits at power 1 and the rate never changes, which is the signature of a linear function.
3. That x^2 as the biggest power is the telltale sign — this one's quadratic.
4. The variable is up in the exponent, which means the function grows by multiplying — that's exponential.
5. In a quadratic table the first differences keep changing, but the differences of THOSE settle to a constant.
6. Step the input evenly and an exponential multiplies the output by the same factor each time — a steady ratio.
7. Even input steps produce even output steps in a linear function — the differences stay the same.
8. At $x = 3$, $2^3 = 8$ but $3^2 = 9$ — so this early, the quadratic is still ahead.
9. Plug in 5: the line gives 16 while the parabola gives 25, so g pulls ahead here.
10. Percent growth multiplies by the same factor over and over, and that repeated multiplying is exactly exponential.
11. The same $\$50$ goes in every month — a fixed amount added repeatedly makes it linear.
12. Doubling each hour means multiplying by 2 again and again, and repeated multiplying is the heart of exponential.

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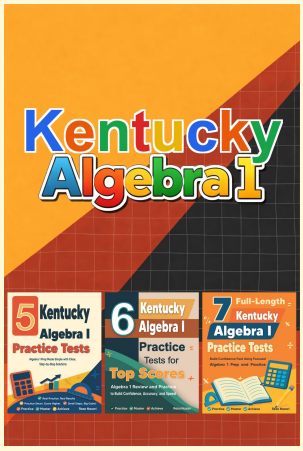

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