

Comparing Linear, Quadratic, and Exponential Models

Algebra 1 • Section 11.3

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| Name: _____ | Date: _____ | Score: _____ / 12 |
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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.

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| <p>1. Which grows faster eventually: $5x + 20$ or 2^x? _____</p> <p>2. Classify $y = 3x + 7$. _____</p> <p>3. Classify $y = x^2 - 4$. _____</p> <p>4. Classify $y = 6(1.4)^x$. _____</p> <p>5. Which has constant second differences? _____</p> | <p>6. Which has a constant ratio in outputs? _____</p> <p>7. Which model has constant first differences? _____</p> <p>8. Compare at $x = 3$: $f = x^2$ and $g = 2^x$. _____</p> <p>9. Compare at $x = 5$: $f = 3x + 1$ and $g = x^2$. _____</p> <p>10. Which model can represent repeated percent growth? _____</p> |
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◆ **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 | 7. Linear |
| 2. Linear | 8. $f(3) = 9$ is greater |
| 3. Quadratic | 9. g is greater |
| 4. Exponential | 10. Exponential |
| 5. Quadratic | 11. Linear |
| 6. Exponential | 12. Exponential |

Step-by-Step Explanations

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



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