GROWTH, DECAY, AND RATE OF CHANGE PROBLEMS

A bacteria culture has 500 cells at noon and 1,400 cells at 3 PM. What is the average rate of change in cells per hour?

At 12 PM: 500 cells
At 3 PM: 1,400 cells
Time difference: 3 hours

$$\frac{1400 - 500}{3 - 0} = \frac{900}{3} = 300$$

Answer: 300 cells per hour

Alex saves $50 every week in a jar. Jordan invests $200 in an account that grows by 5% each week. After 10 weeks, which person has more money? Explain using linear vs exponential growth.

Alex (linear): Saves $50 per week, starting at $0. After 10 weeks:

$$A = 50 \cdot 10 = 500 \quad \textbf{Answer: Alex, linear, \$500}$$

Jordan (exponential):
Starts with $200, grows by 5% per week. Growth factor: 1.05. After 10 weeks:

$$J = 200 \cdot (1.05)^{10} \approx 325.78$$

A plant grows by 15% each week. If it is 12 cm tall now, how tall will it be in 6 weeks? Is this growth or decay?

Initial height: 12 cm
Grows by 15% each week → growth factor: $1 + 0.15 = 1.15$

After 6 weeks: $H = 12 \cdot (1.15)^6 \approx 27.76$

Answer: About 27.8cm tall after 6 weeks. This is growth