

## Solutions

### 9.1 Sequences and Series

9.1.1. Find term 8 of  $10, 7, 4, \dots$ .

Solution. The difference is  $-3$ , so  $a_8 = 10 + 7(-3) = -11$ .

9.1.2. Find term 4 of  $81, 27, 9, \dots$ .

Solution. The ratio is  $1/3$ . Thus  $a_4 = 81(1/3)^3 = 3$ .

9.1.3. Find the sum of the first five terms of the geometric sequence  $3, 6, 12, \dots$ .

Solution. The terms are  $3, 6, 12, 24, 48$ . Their sum is  $93$ , also given by  $3(1 - 2^5)/(1 - 2)$ .

## Solutions

## 9.2 Model Selection

9.2.1. Data at  $x=0, 1, 2, 3$  are 1, 4, 9, 16. Identify a simple model.

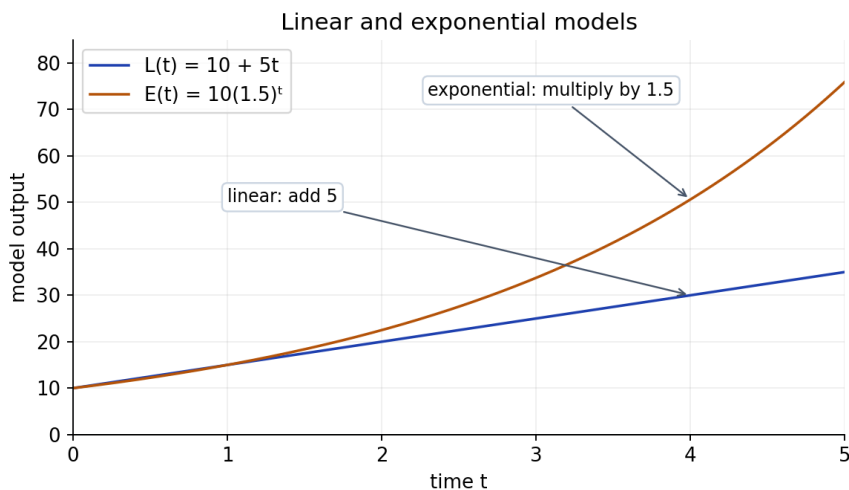
Solution. First differences are 3, 5, 7 and second differences are 2, 2. A fitting quadratic is  $y = (x + 1)^2$ .

9.2.2. Data at  $t=0, 1, 2$  are 100, 80, 64. Identify the factor and a model.

Solution. The ratio is 0.8, giving  $y = 100(0.8)^t$ .

9.2.3. The graph compares  $L(t) = 10 + 5t$  and  $E(t) = 10(1.5)^t$ . Which has constant additive change and which has constant multiplicative change?

Solution.  $L$  increases by 5 per time unit.  $E$  multiplies by 1.5 per time unit, a 50% increase. The models agree initially but later separate.



$L$  adds 5 per step;  $E$  multiplies by 1.5 per step.

Solutions

## 9.3 Technology and Interpretation

9.3.1. A linear model is  $y = 2x + 1$ . Observations at  $x = 0, 1, 2$  are 1, 4, 5. Find the residuals.

Solution. Predictions are 1, 3, 5, so residuals are 0, 1, 0.

9.3.2. A calculator reports an intersection at  $x = 4.37291$ . A context asks for the nearest hundredth of an hour. Report the result.

Solution. The time is approximately 4.37 hours. Keep extra digits while calculating and round the final result.

9.3.3. Why might a population model fitted over five years fail fifty years later?

Solution. Resources, behavior, and growth rates may change. Extrapolation assumes the fitted pattern persists, which the original data cannot establish.