

Solutions

6.1 Choosing a Model

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

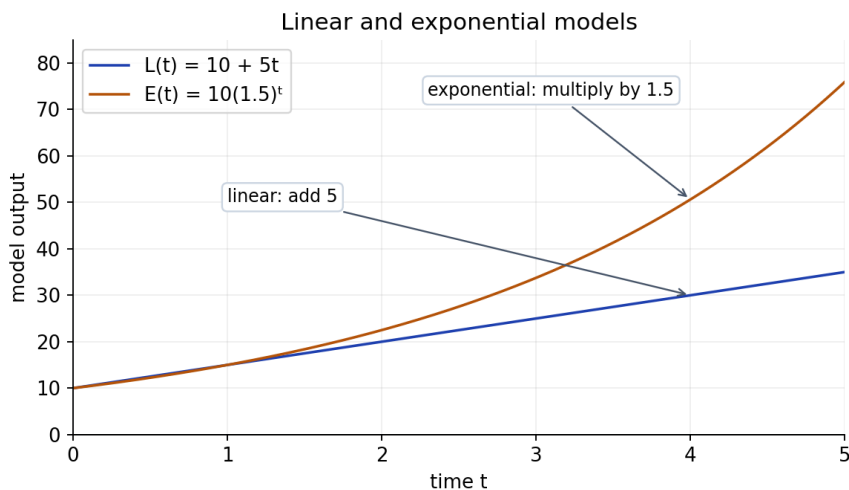
Solution. First differences are 3, 5, 7 and second differences are 2, 2. A fitting quadratic is $y = (x + 1)^2$.

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

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

6.1.3. 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.

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6.2 Interpreting Parameters

6.2.1. A taxi model is $C(d) = 6 + 2.5d$ dollars for d kilometers. Interpret both parameters.

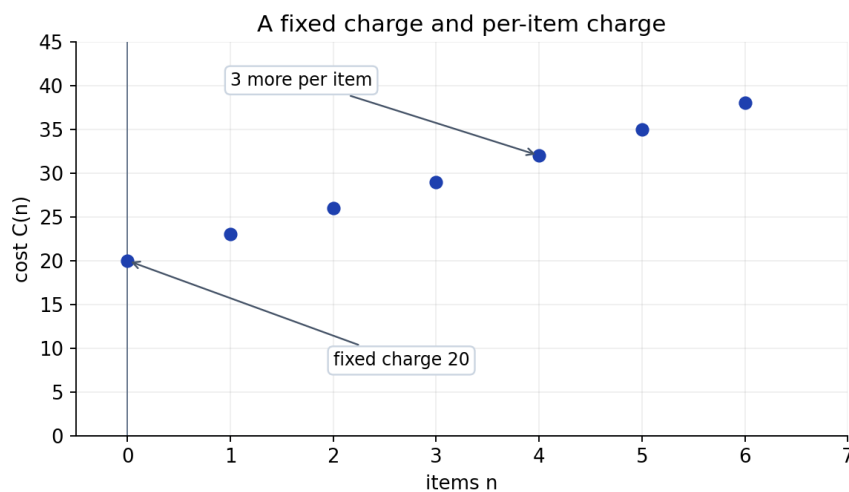
Solution. The initial charge is 6 and the additional charge is 2.50 per kilometer. A distance context requires $d \geq 0$.

6.2.2. Interpret the vertex of $h(t) = -(t - 3)^2 + 16$, measured in meters and seconds over a suitable physical interval.

Solution. The modeled maximum height is 16 meters at $t = 3$ seconds. A physical domain should include only times relevant to the motion.

6.2.3. From the graph of $C(n) = 20 + 3n$, identify the fixed charge and charge per item, assuming nonnegative integer n .

Solution. The fixed charge is 20, the vertical intercept. Each additional item adds 3, the slope. Only nonnegative integer inputs represent item counts.



The fixed charge is 20 and the per-item charge is 3.

Solutions

6.3 Solving Graphically and Algebraically

6.3.1. Solve $x^2 = 9 - x^2$.

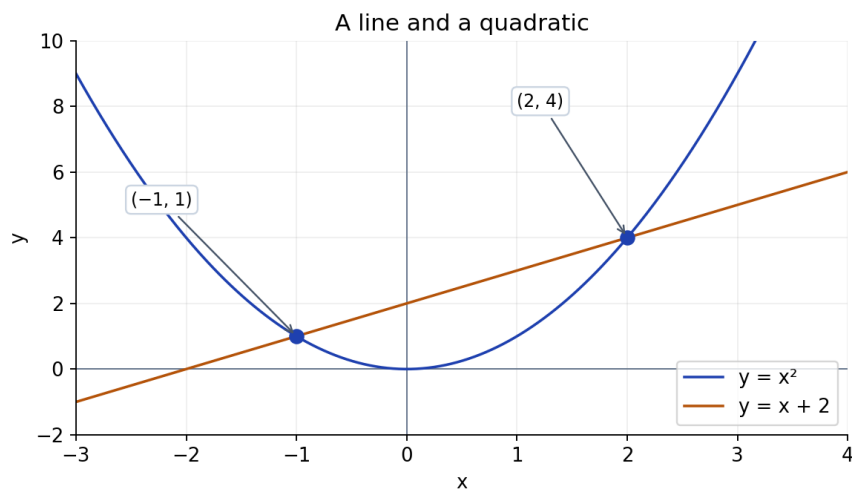
Solution. $2x^2 = 9$, so $x = \pm 3/\sqrt{2} = \pm 3\sqrt{2}/2$.

6.3.2. Solve $\sqrt{x+2} = x$ and state why both squared-equation roots are not valid.

Solution. Squaring gives $x = -1$ or $x = 2$. The original right side must be nonnegative; only $x = 2$ checks.

6.3.3. Use the graphs of $y = x^2$ and $y = x + 2$ to find their intersections, then verify algebraically.

Solution. From $x^2 = x + 2$, factor $(x - 2)(x + 1) = 0$. The intersections are $(-1, 1)$ and $(2, 4)$.



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