

Exercise walk-through

2.4.7

Context Graphs

AQA · GCSE · Mathematics

135. Distance-time graphs and contextual intersections · Foundation

Distance-time graphs and contextual intersections · Foundation

The distance points $(0,0)$, $(2,6)$, $(5,6)$, $(7,10)$, in seconds and metres, give speed $6/2=3$ m/s for the first section, a 3-second stop, then speed $(10-6)/(7-5)=2$ m/s. Average speed for the full interval is $10/7$ m/s, including the stop. Charges $20+3x$ and $44+x$ meet at $x=12$, at cost 56. If speed increases from 0 to 10 m/s over 5 seconds, its average acceleration is $10/5=2$ m/s²; a speed-time graph measures this through its slope.

141. Graphical gradients and area estimates · Higher

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For a distance curve $d=t^2$, the chord from (1,1) to (3,9) has gradient $(9-1)/(3-1)=4$. A tangent at (2,4) passes through (1,0) and (3,8), giving gradient 4 without calculus. A velocity-time trapezium with endpoint velocities 2 and 6 m/s over 3 s has area $(2+6) \times 3/2 = 12$ m. Smaller strips can improve a curved-area estimate; curvature affects over/underestimation. A cost-versus-quantity tangent through (2,12) and (6,28) gives a local rate $(28-12)/(6-2)=4$ yuan per extra item, linking graph slope to a financial interpretation.

183. Reasoning and check

Reasoning and check

For $F(x) = (x^2 - 9)/(x - 3)$, factor $x^2 - 9 = (x - 3)(x + 3)$. Thus $F(x) = x + 3$ for $x \neq 3$; $F(5) = 8$, but $F(3)$ is undefined, not 6. For addition, $1/(x - 1) + 2/(x + 1) = [(x + 1) + 2(x - 1)]/[(x - 1)(x + 1)] = (3x - 1)/(x^2 - 1)$, with $x \neq \pm 1$. At $x = 3$, both forms give 1. For subtraction, the numerator is $(x + 1) - 2(x - 1) = 3 - x$, so the minus sign acts on both terms. Multiplication $[(x - 1)/(x + 2)] \times [(x + 2)/(x + 1)]$ gives $(x - 1)/(x + 1)$, but the original excludes $x = -2$ and $x = -1$. Division $[(x^2 - 1)/(x^2 + 3x + 2)] \div [(x - 1)/(x + 2)]$ gives 1, yet $x = -2, -1, 1$ are excluded: $x = 1$ makes the divisor zero. Finally $F(x) = 6$ reduces to $x + 3 = 6$.

Exercises 2.1·2.3

2.1 (Foundation) Find the first-segment speed.

2.2 (Foundation) Find the duration of the stop.

2.3 (Foundation) Find the final-segment speed.

3 Exam-style questions

Exercises 2.1·2.3

2.1 (Foundation) Find the first-segment speed.

2.1 Change of distance 6 divided by elapsed time 2.

2.2 (Foundation) Find the duration of the stop.

2.2 The horizontal section runs from minute 2 to minute 5.

2.3 (Foundation) Find the final-segment speed.

3 Exam-style questions

2.3 $(10-6)/(7-5)=2$.

Exercise 3.1

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: A horizontal segment on a distance-time graph means the object is moving at its greatest speed.

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3.1 False. Constant distance over a positive time interval gives gradient zero and speed zero. A steeper rising segment represents greater speed.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.