

Exercise walk-through

2.5.2

Simultaneous

AQA · GCSE · Mathematics

141. Graphical gradients and area estimates · Higher

Graphical gradients and area estimates · Higher

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 $x + 3 = 6$.

189. Reasoning and check

Reasoning and check

For distance d in kilometres and cost C in CNY, $C = 8 + 3d$. Rearranging gives $d = (C - 8)/3 = (35 - 8)/3 = 9$ km. Substitution gives $8 + 3(9) = 35$ CNY. Adding the simultaneous equations gives $3x = 12$, so $x=4$ and $y=3$. Both equations check: $2(4) + 3 = 11$, $4 - 3 = 1$. The cost intercept represents the charge at zero distance, not the distance for zero cost.

Exercises 2.1·2.3

2.1 (Foundation) Solve $x+y=12$ and $3x+2y=31$. Find x .

2.2 (Foundation) For those equations, find y .

2.3 (Foundation) In $x+y=12$, find y when $x=7$.

Exercises 2.1·2.3

2.1 (Foundation) Solve $x+y=12$ and $3x+2y=31$. Find x .

2.1 Subtract twice $x+y=12$ from $3x+2y=31$: $x=31-24=7$.

2.2 (Foundation) For those equations, find y .

2.2 Use $x+y=12$, so $y=12-7=5$.

2.3 (Foundation) In $x+y=12$, find y when $x=7$.

2.3 The first equation gives $x+y=12$; substitute $x=7$ to obtain $y=5$.

Exercises 2.4·3.1

2.4 (Higher) Find the larger x-coordinate where $y=x+1$ meets $y=x^2-1$.

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: A pair of simultaneous equations is solved by checking just one of them.

Exercises 2.4·3.1

2.4 (Higher) Find the larger x -coordinate where $y=x+1$ meets $y=x^2-1$.

2.4 Equate the graphs: $x^2-x-2=(x-2)(x+1)=0$. The larger root is 2.

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: A pair of simultaneous equations is solved by checking just one of them.

3.1 False. The point $(0,12)$ satisfies $x+y=12$ but not $3x+2y=31$. The solution $(7,5)$ satisfies both equations: $7+5=12$ and $21+10=31$.

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