Graphs & characteristics

Date _____ Topic 1/5

CUES · QUESTIONS

1. Axis of symmetry of $y = ax^2 + bx + c$?
2. How do you tell max or min from the equation?
3. Domain of any quadratic function?
4. Fastest y-intercept of $y = 3x^2 - 5x + 7$?

Cover the notes. Answer each cue from memory.

NOTES

1 · Worked example Copy one example from the page. Next to each line write WHY in a few words.

2 · Fill in the blanks Cover the steps and redo it. Leave a gap where you are unsure.

3 · Your turn A new question. Then check it against the answer.

SUMMARY — IN MY OWN WORDS, TWO SENTENCES

Vertex form & transformations

Date _____ Topic 2/5

CUES · QUESTIONS

1. Vertex of $y = a(x - p)^2 + q$?
2. $y = (x + 5)^2$ moves which way?
3. Step pattern for $y = x^2$ from the vertex?
4. How many x-intercepts does $y = 3(x - 1)^2 + 2$ have?

Cover the notes. Answer each cue from memory.

NOTES

1 · Worked example Copy one example from the page. Next to each line write WHY in a few words.

2 · Fill in the blanks Cover the steps and redo it. Leave a gap where you are unsure.

3 · Your turn A new question. Then check it against the answer.

SUMMARY — IN MY OWN WORDS, TWO SENTENCES

Standard form → vertex form

Date _____ Topic 3/5

CUES · QUESTIONS

1. What do you add to $x^2 + 10x$ to make a perfect square?
2. First move for $y = 3x^2 + 12x - 1$?
3. Fastest check of your vertex?
4. Does a change when you convert forms?

Cover the notes. Answer each cue from memory.

NOTES

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2 · Fill in the blanks Cover the steps and redo it. Leave a gap where you are unsure.

3 · Your turn A new question. Then check it against the answer.

SUMMARY — IN MY OWN WORDS, TWO SENTENCES

Factored form & writing equations

Date _____ Topic 4/5

CUES · QUESTIONS

1. x-intercepts of $y = a(x - r)(x - s)$?
2. Graph touches the x-axis only at $x = 3$. Form?
3. Which form shows the max/min directly?
4. Zeros -5 and 1. Axis?

Cover the notes. Answer each cue from memory.

NOTES

1 · Worked example Copy one example from the page. Next to each line write WHY in a few words.

2 · Fill in the blanks Cover the steps and redo it. Leave a gap where you are unsure.

3 · Your turn A new question. Then check it against the answer.

SUMMARY — IN MY OWN WORDS, TWO SENTENCES

Max/min problems

Date _____ Topic 5/5

CUES · QUESTIONS

1. Revenue formula?
2. Max of $y = a(x - r)(x - s)$ happens where?
3. Two numbers add to 20. Max product?
4. First move in any optimization word problem?

Cover the notes. Answer each cue from memory.

NOTES

1 · Worked example Copy one example from the page. Next to each line write WHY in a few words.

2 · Fill in the blanks Cover the steps and redo it. Leave a gap where you are unsure.

3 · Your turn A new question. Then check it against the answer.

SUMMARY — IN MY OWN WORDS, TWO SENTENCES

📈 Quadratic Functions • Formula and trap sheet

Everything you need before a test, on the fewest pages. Fold it and keep it in your binder.

Graphs & characteristics

FORMULAS

$x = -\dfrac{b}{2a}$ — Axis of symmetry of $y = ax^2 + bx + c$

$x_{\text{axis}} = \dfrac{r+s}{2}$ — Axis is the midpoint of the x-intercepts r and s

REMEMBER

- $a > 0$ opens up (minimum), $a < 0$ opens down (maximum); the vertex sits on the axis $x = -\frac{b}{2a}$.
- Range uses the vertex y-value: $y \geq q$ (up) or $y \leq q$ (down). Domain is always all real numbers.

WATCH OUT

- Axis of $y = 2x^2 + 8x$ as $x = 2$ → $x = -\frac{8}{2(2)} = -2$ (keep the minus).
- Range from the vertex x-value ($y \geq 2$ for vertex $(2, -5)$) → use the y-value: $y \geq -5$.

Vertex form & transformations

FORMULAS

$y = a(x-p)^2 + q$ — Vertex form: vertex (p, q), axis $x = p$

$(x,\ y) \ \rightarrow \ (x+p,\ ay+q)$ — Mapping rule from $y = x^2$

REMEMBER

- $y = a(x-p)^2 + q$: vertex (p, q), axis $x = p$. $(x+3)^2$ means $p = -3$.
- $|a| > 1$ narrower, $|a| < 1$ wider, $a < 0$ flips. From the vertex: over 1, 2, 3 → up a, $4a$, $9a$.

WATCH OUT

- Vertex of $y = 2(x+5)^2 - 1$ as $(5, -1)$ → $(-5, -1)$.
- $a = \frac{1}{3}$ called narrower → vertical stretch by $\frac{1}{3}$ makes it wider.

Standard form → vertex form

FORMULAS

$x^2 + bx = \left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2$ — The completing-the-square identity

$y = ax^2 + bx + c \ \Rightarrow \ p = -\dfrac{b}{2a},\ q = f(p)$ — Shortcut to the vertex

REMEMBER

- $x^2 + bx = \left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2$
- $a \neq 1$: factor a from the x^2 and x terms only; the subtracted square leaves the bracket times a.

WATCH OUT

- $3(x^2 - 4x + 4 - 4) + 5 = 3(x-2)^2 + 1$ → the -4 leaves as -12: $3(x-2)^2 - 7$.
- $-x^2 + 6x = -(x^2 + 6x)$ → $-(x^2 - 6x)$.

Factored form & writing equations

FORMULAS

$y = a(x-r)(x-s)$ — Factored form: x-intercepts r and s

$x = \dfrac{r+s}{2}$ — Axis of symmetry

REMEMBER

- $y = a(x-r)(x-s)$: zeros r, s (opposite signs to the brackets); axis $x = \frac{r+s}{2}$.
- Zeros alone do not fix the parabola: always use a third point to find a.

WATCH OUT

- $y = (x+4)(x-1)$ zeros $4, -1$ → $-4, 1$.
- $3x^2 - 3x - 18 = (x-3)(x+2)$ → $3(x-3)(x+2)$ (keep a).

Max/min problems

FORMULAS

$x = -\dfrac{b}{2a}$ — Where the max/min happens

$R = (\text{price}) \times (\text{quantity})$ — Revenue

REMEMBER

- Optimize = find the vertex. "When / which value" → x-coordinate; "how much" → y-coordinate.
- Build the function first: area $= lw$, revenue = price × number sold.

WATCH OUT

- "What is the max height?" answered $t = 3$ → give $h(3)$.
- Answering $n = 4$ as the price → price is $p_0 + 4$.