

Week 5 Group Video Lab

The Graphing Hot Seat

One teacher, four questions and one graph revealed at the end.

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Calculus 1 · Winter term 2026–2027

The mission

Work in a group of exactly five students. Record a miniature class about one complete graph analysis.

One student acts as the teacher. The other four students interrupt the explanation with one mathematical question each. The teacher must answer every question during the video.

Your group will produce:

- one correct step-by-step analysis;
- one final graph;
- one video of at most three minutes.

The questions form part of the solution.

The function assigned to the group

Let a be the number of different countries represented in your group. Thus,

$$1 \leq a \leq 5.$$

Substitute your numerical value of a and analyse

$$f(x) = x + \frac{a}{x}.$$

Your analysis must determine:

- the domain and intercepts;
- the limits at 0 and at $\pm\infty$;
- every asymptote;
- monotonicity, local extrema and absolute extrema;
- the range and the final graph.

Use the numerical value of a throughout the video.

The graph remains hidden

The teacher must begin from the formula. Do not show the graph during the calculation.

1. Analyse the domain, limits and asymptotes.
2. Use f' and a sign chart to classify the extrema.
3. Predict where the two branches must lie.
4. Reveal the graph only during the final thirty seconds.

You may prepare the graph in Desmos or GeoGebra, or draw it clearly on paper. When you reveal it, point out the asymptotes and the extrema.

The calculations must predict the graph before the software confirms it.

Five students, five essential roles

Student 1

Acts as the teacher, explains the solution and answers all four questions.

Student 2

Asks a question about the domain or a one-sided limit at $x = 0$.

Student 3

Asks a question that tests the justification of an asymptote.

Student 4

Asks a question about the derivative, the sign chart or the classification of an extremum.

Student 5

Asks a question about absolute extrema, the range or the final shape of the graph.

The group prepares the solution together. The teacher is responsible for connecting the four answers into one coherent explanation.

Questions that test understanding

Each question must ask for a reason. A question that can be answered only with “yes”, “no” or a single number does not count.

Useful ways to begin include:

- “How do you know that ...?”
- “Why does this limit imply that ...?”
- “Could this extremum be absolute? Explain.”
- “What feature of the calculation forces this part of the graph?”

At least one question must challenge a likely mistake, such as confusing a local maximum with an absolute maximum.

A strong question exposes a possible mistake and asks for its correction.

What to submit

Submit one video file or one accessible video link for the whole group.

Before submitting, check that the video contains:

- the names of all five students and the chosen value of a ;
- one complete mathematical explanation;
- four questions that require justification;
- four clear answers from the teacher;
- one final graph with the asymptotes and extrema identified;
- a duration of at most three minutes.

Send the video to: sheldon.dantas@gmail.com