

- Work on these problems in your assigned group, but each person will turn in their own solutions.
- These problems are meant to promote **active learning**. Some of the material has been covered in class, while some will help you learn new material.
- Margaret and I will be available to help you with the problems. You should also ask your group members questions, and share your ideas with each other.
- Focus on **understanding** the solution each problem, and on being able to **explain** them to each other.

For each limit, either find the value (if it exists), or answer $+\infty$, $-\infty$, or “DNE” (for “Does Not Exist”).

1. Find both $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$ and $\lim_{x \rightarrow 1} \frac{x^2 - 4}{x - 2}$. Why is one easier than the other?

2. $\lim_{x \rightarrow 2^-} \frac{x^2 + 6x + 8}{x - 2}$

3. $\lim_{x \rightarrow 2} \frac{x^2 + 5x - 14}{x^2 - 4x + 12}$

4. $\lim_{x \rightarrow 2} \frac{x^2 + 5x - 14}{x^2 - 8x + 12}$

5. $\lim_{x \rightarrow 0} \frac{x + 1}{x(x + 2)}$

Note: Try taking the two one-sided limits separately ($\lim_{x \rightarrow 0^-}$ and $\lim_{x \rightarrow 0^+}$). If you get different results, then answer “DNE” for the overall limit. You should try this strategy in situations where you need to do a “sign analysis” (when you see $c/0$) but aren’t sure how to proceed for the two-sided limit.

6. $\lim_{x \rightarrow (-3)^+} \frac{x^2 + 4x + 3}{x^2 - 2x - 15}$

7. $\lim_{x \rightarrow -3} \frac{x^2 + 4x + 3}{x^2 + 6x + 9}$

8. $\lim_{t \rightarrow 1} \frac{t - 1}{g(t^2) - 3}$ where $g(t) = 2t + 1$.

9. $\lim_{x \rightarrow -5} \frac{\frac{1}{4 - x} - \frac{1}{9}}{x + 5}$

$$10. \lim_{x \rightarrow -3} \frac{x^2 - 4x - 21}{\sqrt{1-x} - 2}$$

Hint: this limit requires the “conjugate trick,” where you multiply on top and on bottom by a conjugate expression. Call one of us over if you are unsure how to proceed or want to check if you’ve done this correctly.

$$11. \text{ Let } f(x) = \frac{1}{x}. \text{ Compute } \lim_{t \rightarrow 2} \frac{f(t-1) - 2f(t)}{t^2 - 4}$$

$$12. \text{ Let } g(x) = \sqrt{x}. \text{ Compute } \lim_{s \rightarrow 1} \frac{g(s^2 + 8) - 3}{s - 1}$$

$$13. \lim_{x \rightarrow 4^-} \frac{|x - 4|}{x - 4}$$

$$14. \lim_{x \rightarrow 4^+} \frac{|x - 4|}{x - 4}$$

$$15. \lim_{x \rightarrow 3} \frac{\frac{x}{x-2} - \frac{x+6}{x}}{x-3}$$

$$16. \lim_{x \rightarrow 3} -\frac{1}{(x-3)^2}$$