<table>
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“I like limits where $x$ goes to infinity better than limits where GPA goes to zero.”
Show all work.

1. Find the set of all $x$ for which the following are true and graph the set.
(18 points, 6 each)

   a) $3x - 1 \leq 1 - x \leq x$

   b) $\frac{2}{x} < x$

   c) $|3 - 2x| > 4$

2. Graph the parametric equation $x = t - \sin t, y = 1 - \cos t$ for $-7 \leq t \leq 7$ and show the direction of increasing $t$. What is this curved called?
(8 points)
3. Compute the following limits showing all necessary steps, using algebra and limit rules (you don’t have to state the rules you use.) (The answer alone is only worth 1 point.) (45 points, 5 each)

\[ a) \lim_{x \to -1^-} \frac{x^2 - 1}{|x + 1|} \]

\[ b) \lim_{x \to 3} \frac{x - 3}{x^2 + x - 12} \]

\[ c) \lim_{x \to \infty} \frac{x + 5}{\sqrt{2x^2 + 4}} \]

\[ d) \lim_{x \to 2} \frac{x^3 - 8}{x^2 - 4} \]

\[ e) \lim_{x \to 0} \left( \frac{1}{x(1 + x)} - \frac{1}{x} \right) \]
f) \( \lim_{x \to -\infty} \frac{\cos(x^2)}{x} \)

g) \( \lim_{x \to 0} \frac{1 - \sqrt{1 - x^2}}{x} \)

h) \( \lim_{x \to 1^+} \frac{|2x - 1| - |x - 1|}{x - 1} \)

i) \( \lim_{x \to 0} \frac{x^3}{x^2 + 1} \)
4. Find the following limits. No work is required.
(10 points)

5. If \( \lim_{x \to a} (f(x) + g(x)) = 2 \) and \( \lim_{x \to a} (f(x) - g(x)) = 1 \) what can you say about \( \lim_{x \to a} f(x)g(x) \)?
(10 points)

6. Let \( f(x) = |x| + x \). Is \( f(x) \) continuous at \( x = 0 \)? Graph this function.
(6 points)
7. Use the definition that $f'(x) = \lim_{h \to 0} \frac{f(x+h)-f(x)}{h}$ to compute $f'(x)$ for the following functions.
(16 points, 8 each)

   a) $f(x) = 355x^2 + x$

   b) $f(x) = \frac{1}{x^2}$