1. Compute the following limits or state that they do not exist. (*THINK before doing algebra!*)

(a) $\lim_{x\to-\infty} \dfrac{2x-2}{x^2+1} =$

(b) $\lim_{x\to 0} \dfrac{2x-2}{x^2+1} =$

(c) $\lim_{x\to\infty} \dfrac{x^2-2}{x^2+1} =$

(d) $\lim_{x\to\infty} \dfrac{2}{x} - \dfrac{1}{\ln x} =$

(e) $\lim_{x\to-\infty} \dfrac{x^2}{\sqrt{x^4+1}} =$

(f) $\lim_{x\to 2} \dfrac{x^2-4}{2x^2-3x-2} =$

(g) $\lim_{t\to\infty} \sqrt{t^2+at} - \sqrt{t^2+bt} =$

(h) $\lim_{x\to\infty} \dfrac{1-e^x}{1+2e^x} =$

2. Find all the vertical and horizontal asymptotes of the graph

$$y = \frac{2x^2 + x - 1}{x^2 + x - 2},$$

and clearly state limits which justify these asymptotes. Also make a rough sketch of the graph. (*Confirm your work by graphing calculator or Desmos etc.?*)

3. Sketch the graph of a function that satisfies all of the given conditions:

- f is even
- $f(0) = 0$
- $y = -1$ is a horizontal asymptote
- $\lim_{x \to 3^+} = 2$
- $\lim_{x \to 3^-} f(x) = \infty$
- f is discontinuous at $x = 4$