1. (15 points) Sketch the graph \( R(x) = \frac{x^2 - 1}{x^2 - 4} : \)

(a) Factor the numerator and denominator and find the domain.
\[
R(x) = \frac{(x+1)(x-1)}{(x+2)(x-2)}, \quad \text{dom}(R) = \mathbb{R} \setminus \{x \mid x \neq \pm 2\}
\]

(b) Write \( R(x) \) in lowest terms (simplify) to get \( S(x) \).
\[\text{Already}\]

(c) Locate the and plot the intercepts.
\[\text{x-ints:} \quad R(x) = 0 \Rightarrow x = \pm 1 \]
\[\text{y-ints:} \quad R(0) = -\frac{1}{4} = -\frac{1}{4} \]

(d) Find vertical asymptotes (V.A.). Draw a vertical dashed line at these points.
\[\text{V.A.} \quad x = \pm 2 \]

(e) Find the horizontal asymptotes (H.A.) and oblique asymptotes. Draw a horizontal dashed line and figure out if the graph ever crosses the H.A.
\[\text{H.A.} \quad y = 1 \quad \frac{x^2 - 1}{x^2 - 4} = 1 \Rightarrow x^2 - 1 = x^2 - 4 \]
\[= 0 \quad -1 = -4 \]
\[= 0 \quad \text{no intersection of H.A.} \]

(f) Use the zeros of the numerator and denominator to break up the real number line. Use test points in each interval to find out where the graph is in each interval and plot the points.
\[\begin{array}{c|c|c|c|c}
\text{x} & \text{R(-2)} & \text{x=0} & \text{R(1)} & \text{R(3)} \\
\hline
-3 & \frac{8}{5} & \text{R(0)=}\frac{1}{4} & 1 & \frac{8}{5} \\
\end{array}\]
(g) Analyze the behavior near the asymptotes.
(h) Draw a sweet graph.

2. (Bonus +2) Tell me about your exciting plans for Thanksgiving break. If you don’t have exciting plans make something up.