Exercise 1. The domain is $\mathbb{R}$. The range is $(0, +\infty)$. The inverse is
\[ f^{-1}(x) = \frac{x^2 - 1}{2x}. \]

Exercise 2. The domain is $\mathbb{R} \setminus \{0\}$. The range is $(-\infty, 0) \cup (1, +\infty)$. The inverse is
\[ f^{-1}(x) = \ln \left( \frac{x - 1}{x} \right). \]

Exercise 3. The domain is $\mathbb{R} \setminus \{n\pi \mid n \in \mathbb{Z}\}$. The range is $(-\infty, -1]$. It is not 1-1 because it is periodic.

Exercise 4.
\[ \lim_{x \to 1^-} f(x) = -\infty \]
and
\[ \lim_{x \to 2^+} f(x) = 0. \]
A very important point for finding the limit for $x \to 1^-$ is to correctly decide the sign of $f$ on a small open interval on the left of 1. For this, you can notice that $x - 2 > 0$ when $x > 2$, $x + 3 > 0$ when $x > -3$, $x - 4 > 0$ when $x > 4$, and $x - 1 > 0$ when $x > 1$. 