1. Does the equation $x = |y|$ define $y$ as a function of $x$? Justify your answer.

   We see that the equation $x = |y|$ doesn't define $y$ as a function of $x$ because it fails the vertical line test.

2. Let $f(x) = g(x) = \sqrt{x-1}$. What is the domain of $f(x)$ and $g(x)$? What is the domain of the product $(f \cdot g)(x) = f(x) \cdot g(x)$?

   The domain of $f(x)$ and $g(x)$ is $x \geq 1$ or in interval notation $[1, \infty)$.

   $(f \cdot g)(x) = f(x) \cdot g(x) = \sqrt{x-1} \cdot \sqrt{x-1} = x-1$. The domain of $(f \cdot g)(x)$ is the intersection of the domains of $f(x)$ and $g(x)$ since the domains of $f(x)$ and $g(x)$ are the same: $x \geq 1$.

   The domain of $(f \cdot g)(x)$ is also $x \geq 1$.

3. Let $f(x) = \frac{1}{x-2}$ and $g(x) = \frac{x}{x-3}$. Find the domain of the composition $f(g(x))$.

   We see that $x \neq 3$. Now since $f(x)$ is undefined at $x = 2$, we need to ensure that

   \[
   \frac{x}{x-3} \neq 2 \quad \text{or} \quad x \neq 6
   \]

   Hence the domain of $f(g(x))$ is the set of all real numbers except $x = 3$ and $x = 6$ or in interval notation $(-\infty, 3) \cup (3, 6) \cup (6, \infty)$. 