Problem 1. Find the domain of the following functions.

1. $y = \sqrt{3 - x}$.
2. $y = \dfrac{x}{x^2 - 1}$.
3. $y = x^2\sqrt{x^2 - 1}$.
4. $y = 1 + \sqrt{9 - x^2}$.
5. $y = \dfrac{x + 1}{\sqrt{4 - x^2}}$.

Problem 2. If $G(z) = \sqrt{z^2 - 1}$, find $G(a^2)$, $G(x - 1)$.

Problem 3. Let $f(x) = \begin{cases} x & 0 \le x \le 2 \\ x^2 & x > 2 \end{cases}$. Find the value of $f(1)$, $f(2)$ and $f(3)$.

Problem 4. Let $f(x) = 4x^2$ and $g(x) = \sqrt{x}$. Find $f(g(x))$, $g(f(x))$ and $g(g(x))$.

Answers to Problem 1. (1) $(-\infty, 3]$, (2) $(-\infty, -1) \bigcup (-1, 1) \bigcup (1, \infty)$,
(3) $(-\infty, -1] \bigcup [1, \infty)$, (4) $[-3, 3]$, (5) $(-2, 2)$.

Answers to Problem 2. $G(a^2) = \sqrt{a^4 - 1}$, $G(x - 1) = \sqrt{x^2 - 2x}$.

Answers to Problem 3. $f(1) = 1$, $f(2) = 2$, $f(3) = 9$.

Answers to Problem 4. $f(g(x)) = 4x$, $g(f(x)) = 2\,|x|$, $g(g(x)) = \sqrt[4]{x}$.