$$f(x) = \sqrt{\frac{x-1}{x+1}} \qquad\qquad g(x) = x^2 + 2$$

1. (*30 points*) Find the domain of f, and find the domain of g.

The domain of f is the set of real numbers x for which the fraction $\frac{x-1}{x+1}$ is greater than or equal to zero. Analyzing the signs of the terms in the fraction we obtain:

	-1		1	
$x - 1$	$-$	$-$		$+$
$x + 1$	$-$	$+$		$+$
	$+$	$-$		$+$

Since the value -1 is not included in the domain because we can not divide by zero, we obtain.

$$\text{Domain}(f) = (-\infty, -1) \cup [1, \infty)$$

The domain of g is the set of all real numbers

$$\text{Domain}(g) = \mathbb{R}$$

2. (*20 points*) Find the range of g.

Since $g(x) = x^2 + 2 \geq 2$, then

$$\text{Range}(g) = [2, \infty)$$

3. (*25 points*) Is $f \circ g$ defined? Justify your answer.

Since the Range$(g) = [2, \infty)$ is contained in the Domain$(f) = (-\infty, -1) \cup [1, \infty)$, then the function $f \circ g$ is defined.

4. (*25 points*) If $f \circ g$ is defined, find a formula for $f \circ g$.

$$
\begin{aligned}
(f \circ g)(x) &= f(g(x)) \\
&= f(x^2 + 2) \\
&= \sqrt{\frac{(x^2 + 2) - 1}{(x^2 + 2) + 1}} \\
&= \sqrt{\frac{x^2 + 1}{x^2 + 3}}
\end{aligned}
$$