Problem 1. Find the equation of the line perpendicular to the line $2y + x - 32 = 0$ passing through the point $C = (2, -1)$. Give your answer in slope-intercept form.

Solution. First we find the slope of the given line. We solve for $y$:

$$y = -1/2x + 16,$$
and read off the slope $-1/2$.

Then the slope of the perpendicular line is opposite reciprocal of $(-1/2)$, which is 2. Now we use the point-slope formula for the line with slope 2, passing via the point $(1, -1)$:

$$y - y_1 = m(x - x_1)$$

$$y + 1 = 2(x - 2)$$

Single out $y$ we get the answer (the slope-intercept form) $y = 2x - 5$. □

Problem 2. Let

$$f(x) = \frac{\sqrt{x^2 - 6x + 5}}{x^2 - 2x}.$$

Find the domain of the function $f(x)$.

Solution. 1) The bottom $x^2 - 2x = 0$, $x = 0, 2$ gives us points to exclude from the domain.

2) We need to solve inequality

$$x^2 - 6x + 5 \geq 0$$

First, we solve the equation $x^2 - 6x + 5 = 0$ and get $x = 5, 1$, these are the marked points on the number line.

We test the three intervals and get:

$$+ + + + + + - - + + +$$

3) Answer: $x \in (-\infty, 0) \cup (0, 1] \cup [5, +\infty)$. □