Math 121 – Quiz 1 Solution

1. Find the domain of the function:

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

2. Write the rule of the function $g(x)$ obtained by transforming the function $f(x) = x^2$ using the following transformations (in the given order):

   (1) shift 1 unit downward

   (2) reflect about the x-axis

   (3) shift 3 units to the right

   (4) vertically stretch by a factor of 2

Solution:

1. We need $x - 2 \geq 0 \Rightarrow x \geq 2$. Also, since:

$$\begin{aligned} x^2 - 5x + 6 &= 0 \\ (x-2)(x-3) &= 0 \\ x = 2,\ x &= 3 \end{aligned}$$

   we must have $x \neq 2$ and $x \neq 3$. Therefore, the domain is: $\boxed{2 < x < 3 \text{ or } x > 3}$. Using interval notation, we would write $(2, 3) \cup (3, \infty)$.

2. Starting with $f(x) = x^2$, we have:

   (1) $x^2 \longrightarrow x^2 - 1$

   (2) $x^2 - 1 \longrightarrow -(x^2 - 1)$

   (3) $-x^2 + 1 \longrightarrow -(x-3)^2 + 1$

   (4) $-(x-3)^2 + 1 \longrightarrow 2[-(x-3)^2 + 1]$

   The function $g(x)$ is then:

$$\boxed{g(x) = -2(x-3)^2 + 2}$$