Inequalities are used frequently to describe subsets of real numbers or to give constraints in applications. We need to be able to solve the inequalities used and find useful ways in which to describe the solutions to them. In this problem we will consider some exercises that involve inequalities.

(a) Students in a first semester calculus course were given a diagnostic quiz to see how much algebra and precalculus they remembered from the prerequisite courses. One of the problems asked students to solve the inequality

$$x^2 - 2x - 4 > -2x + 5$$

Here is a solution one of the students submitted:

$$\begin{aligned} x^2 - 2x - 4 &> -2x + 5 \\ x^2 &> 9 \\ x &> \pm 3 \end{aligned} \qquad \Longrightarrow \text{ The answer is } x > \pm 3.$$

The above solution is incorrect. Write out an explanation using 1-2 English sentences of why the above solution is not valid. And now that you understand why the given solution is not correct, write a correct solution.

(b) Find the domain of $f(x) = \dfrac{4x + 5}{\sqrt{3x^2 - 10x - 8}}$. Express the domain using interval notation and then express your interval in terms of an inequality involving absolute value. Report your final answer in a brief sentence. For example, if your domain is given by the interval was $[2, 4]$, you would write:

The domain is the interval $[2, 4]$. The interval $[2, 4]$ can be described using the inequality $|x - 3| \leq 1$.