Lesson 2 Presentation

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Problem 1.4.14

If $x/(x-2) \leq 3$, then $x < 2$ or $x \geq 3$, where x is a real number.

To establish the logic for the proof we start by defining are statements p and q.

$$p : \frac{x}{x-2} \leq 3$$

$$q : x \geq 3 \text{ or } x < 2$$

Converting the original statement above into short hand we get,

$$p \Rightarrow q$$

Proof:

We prove this directly by letting p be true,

$$\frac{x}{x-2} \leq 3$$

For simplicity we solve for x by multiplying $(x-2)$ on both sides of the inequality.

$$x \leq 3(x-2)$$

Distributing the 3,

$$x \leq 3x - 6$$

Subtract x and add 6 to both sides,

$$6 \leq 2x$$

Divide by 2 so that p becomes,

$$x \geq 3$$

Now consider the implication $p \Rightarrow q$

$$x \geq 3 \text{ implies } x \geq 3 \text{ or } x < 2$$

Since p is true we know that $x \geq 3$ which will also make the consequent true.

$$4x$$