

(b)  $\sqrt{n} \notin \mathbb{Q}$  if  $n$  is not a perfect square (HINT: write  $n = k^2 r$ , where  $r$  does not contain any square factor),

If  $n$  is not a perfect square, then at least one of its factors is not a square. So we can write  $n = k^2 r$  where  $r$  does not contain any square factors.

Now, we argue by contradiction. Suppose that  $n$  is not a perfect square and  $\sqrt{n} \in \mathbb{Q}$ .

Then we can write  $\sqrt{n} = p/q$ ,  $p, q \in \mathbb{N}$ , where  $p$  and  $q$  have no common factors ( $p/q$  is in its simplest form).

Then  $n = p^2/q^2 = k^2 r$  or, equivalently,  $r = p^2/k^2$ . But this is impossible because

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