

Show all work needed to reach your answers.

1. (10 points) Are the nonnegative real numbers, $[0, \infty)$, well-ordered? Please explain why or why not.

The nonnegative real numbers, $[0, \infty)$, is not well-ordered.
"Well-ordered" requires that every subset of $[0, \infty)$ contain a
least element. Among many examples, $(0, 1) \subseteq [0, \infty)$
 an $(0, 1)$ does not contain its least element, 0.

High: 20
 Median: 17
 Low: 3

2. (10 points) Please explain why $\mathbb{Q}$ (the set of rational numbers) is countable.

$\mathbb{Q}$ is countable because it can be put in one-to-one correspondence with $\mathbb{Z}^+$. Let $r \in \mathbb{Q}$. Then $r = p/q$ for some $p \in \mathbb{Z}$ and $q \in \mathbb{Z}^+$ where p and q have no common divisors. Now take 0 as the first member of $\mathbb{Q}$, +1 and -1 as the second and third elements, and the rest of $\mathbb{Q}$ counted based on the value of $|p|+q$ since there are only a finite number of rationals with any given value of $|p|+q$ according to the table

- Counted $\mathbb{Q}^+$ rather than $\mathbb{Q}$ (-2)
- No explicit count (-1) or (-2)

