Q2: Consider the function $f(x) = \frac{1}{2}x$ defined on $(0, 1)$.We first claim that it is a contraction. Indeed,

$$|fx - fy| = |\frac{1}{2}x - \frac{1}{2}y| = \frac{1}{2}|x - y|$$

We see that f is a contraction with constant $k = \frac{1}{2}$. This has no fixed points, since $\frac{x}{2} = x$ is solved by 0, but this is not in the domain of the function.