1. Show that there is a number x such that

$$10^x = x^2.$$

Let $f(x) = 10^x - x^2$

Observe $f(-1) = \frac{1}{10} - 1 = -\frac{9}{10} < 0$.

Also, $f(0) = 1 - 0 = 1 > 0$.

Since $f(x)$ is continuous on $[-1, 0]$ there is a

number x in $[0, 1]$ where $f(x) = 0$ and hence $10^x = x^2$.

2. Compute

$$\lim_{x \to \infty} \frac{x^2 - 1}{x^2 + 1}$$

$$\lim_{x \to \infty} \frac{x^2 - 1}{x^2 + 1} = \lim_{x \to \infty} \frac{1 - 1/x^2}{1 + 1/x^2} = \frac{1 - 0}{1 + 0} = 1$$