

Answer on Question #85780 – Math – Quantitative Methods

Question

Find by Newton's method the root of the equation
 $x \log_{10} x = 4$
near $x=6$ correct to 3 decimal places of digits.

Solution

$$x \log_{10} x = 4 \rightarrow x \log_{10} x - 4 = 0 \rightarrow \frac{x \ln x}{\ln 10} - 4 = 0.$$

$$\text{Newton's method: } x_{n+1} = x_n - \frac{x_n \ln x_n - 4 \ln 10}{\ln x_{n+1}}.$$

$$x_0 = 6.$$

$$x_1 = 5.4483.$$

$$x_2 = 5.4386.$$

$$x_3 = 5.4386.$$

So, $x = 5.4386$ is correct to 3 decimal places of digits.