Question 4 **(8 marks)**

An internet search engine uses a logarithmic scale to rank the importance of internet websites. If a website has S visits each week, the site rank, R, is given by

$$R = 2\log_{10}\left(\frac{S}{S_0}\right)$$

where S_0 is the reference value (the same for all websites). The reference value is the minimum number of visits per week required for a website to register on the site rank scale.

(a) Determine the site rank for a website whose weekly visits are one hundred times the reference value. (2 marks)

(b) Given that a site rank of 12 is assigned to a website with 1.5 billion (1.5×10^9) visits per week, determine the value of S_0. (3 marks)

(c) The plot of $y = \log_{10}(x)$ is shown below. If a website has a site rank of 3.2, use the plot and your answer from part (b) to approximate the website's number of weekly visits.

(3 marks)