2017 SMM2 Week 5 Investigation

Show full working.

Q1. Simplify $(x^2 + y^2)^{\frac{1}{2}} - x^2(x^2 + y^2)^{-\frac{1}{2}}$

Q2. Show that $\log_{ab} x = \frac{\log_a x}{1 + \log_a b}$

Q3. A number of earthquakes have been recorded in the Calamari Desert. The earthquakes' Richter magnitude, M, can be modelled by the equation

$$M = A\log_{10}E + B$$

where E is the energy in joules.

(i) If the Richter magnitude of an earthquake is 8.5 with an energy of 10^{17} joules, substitute the values into the equation above.

(ii) If the Richter magnitude of an earthquake is 3.8 with an energy of 10^{10} joules, substitute the values into the equation above.

(iii) Using the two equations, find the values of A and B. Give the answer to two decimal places. Substitute these values into the equation.

(iv) If the magnitude of an earthquake is 7.8, find the energy, rounding the index to the nearest whole number.

(vi) If the energy of an earthquake is 10^{12} joules, find the magnitude of the earthquake. Give your answer correct to two decimal places.