8. [8 points] *Throughout this problem, make sure that you clearly show your work step-by-step.* In the 1970's, seismologists developed the Moment Magnitude Scale (MMS) to estimate the magnitude of large earthquakes in terms of the energy released. Unlike the Richter scale, which is based on the size of seismic waves, the MMS is based on seismic moments (which represent the energy released in an earthquake). The MMS rating of an earthquake is defined to be

$$S = \frac{2}{3} \log\left(\frac{M}{A}\right)$$

where M is the seismic moment of the quake (in dynes/cm) and A is a positive constant.

a. [4 points] Let S_1 and S_2 represent the MMS ratings of two earthquakes with seismic moments M_1 and M_2, respectively. Using properties of logarithms, find a formula for $S_2 - S_1$ in terms of M_1 and M_2. **Simplify your formula as much as possible.**

Answer: $S_2 - S_1 =$ _____.

b. [4 points] The San Francisco earthquake of 1989 had an MMS rating of 6.9 and the Northridge, CA earthquake of 1994 had an MMS rating of 6.7. Based on these ratings, how many times greater than the Northridge seismic moment was the San Francisco seismic moment? (Give your answer in exact form or round to the nearest 0.01.)

Answer: The seismic moment from the San Francisco earthquake was _____ times greater than the seismic moment of the Northridge earthquake.