2) (5 pts) ANL (Algorithm Analysis)

An image processing algorithm takes $O(n^3)$ time to run to filter an n x n pixel picture. If it takes 8 seconds to process a 1024 x 1024 pixel picture, how long will it take to process a 1536 x 1536 pixel picture?

Let T(n) be the run time of the algorithm. $T(n) = cn^3$ for some constant c. Use the first piece information to set up an equation to solve for c:

$$T(1024) = c(1024^3) = 8sec$$
$$c = \frac{8}{1024^3} sec$$

Now, solve for T(1536):

$$T(1536) = c(1536^3) = \frac{8sec}{1024^3} \times 1536^3 = (8\text{sec}) \times \left(\frac{1536}{1024}\right)^3 = (8\text{sec}) \times \left(\frac{3}{2}\right)^3 = 27sec$$

Grading: 2 pts solving for c, 2 pts plugging in 1536, 1 pt simplifying to 27 sec.