

## 2) (5 pts) ANL (Algorithm Analysis)

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

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

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