

## 2) (10 pts) ANL (Algorithm Analysis)

An algorithm processes an array of size  $r$  by  $c$  in  $O(rc^2)$  time. For an array of size  $r = 200$  and  $c = 500$ , the algorithm takes 5.0 seconds. How long, in seconds, will the algorithm take to process an input array of size  $r = 800$  and  $c = 300$ ? Please express your answer with exactly one digit after the decimal point.

Let  $T(r, c) = Mrc^2$ , for some constant  $M$  and represent the run time of the algorithm processing the array. Using the given information, we have:

$$T(200, 500) = M(200)500^2 = 5sec$$

$$50,000,000M = 5sec$$

$$M = 10^{-7}sec$$

Now, we must solve for  $T(800, 300)$ :

$$T(800, 300) = (10^{-7}sec)(800)300^2 = (10^{-7}sec)(72)(10^6) = 7.2seconds$$

**Grading: 2 pts for setting up equation with constant,  $r$  and  $c$ .**

**2 pts for solving for the constant ( $M$  in what's above)**

**2 pts for setting up equation for solution**

**4 pts for properly simplifying the answer to 7.2 seconds (may award partial)**