1. [4 points] If you have not already done so, neatly write your 8-digit UMID number, your initials, your instructor's first and/or last name, and your section number in the spaces provided.

2. [9 points] The chain grocery store Mathmart stocks their shelves full of brain-targeted foods for their customers on a regular basis. The time (in minutes) it takes to stock the shelves after the delivery truck arrives is represented by the cumulative distribution function (cdf):

$$R(t) = \begin{cases} 0 & t < 1 \\ 1 - \frac{1}{t^3} & t \geq 1 \end{cases}$$

a. [3 points] Find a formula for $r(t)$, a probability density function (pdf) corresponding to $R(t)$.

Solution: We must have $r(t) = R'(t)$ whenever it is defined. Using our formula for part (a), we see that a possible formula is

$$\begin{cases} 0 & t < 1 \\ 3\frac{1}{t^4} & t \geq 1, \end{cases}$$

where we have chosen $r(1) = 3$. We could have chosen $r(1)$ to be any non-negative number since $R'(t)$ is not defined at 1.

b. [3 points] What is the median amount of time (in minutes) it takes to stock the shelves?

Solution: The median occurs when $R(t) = .5$. Setting

$$1 - \frac{1}{t^3} = .5$$
$$.5 = \frac{1}{t^3}$$
$$t = 2^{\frac{1}{3}}.$$

Therefore, the median amount of time to stock the shelves in minutes is $2^{\frac{1}{3}}$ minutes.

c. [3 points] Write an integral representing the mean amount of time (in minutes) it takes to stock the shelves. Your expression should not contain r or R. Do not solve this integral.

Solution:
$$\int_1^\infty \frac{3}{t^3} dt$$