

6. [13 points]

- a. [4 points] Which, if any, of the following are antiderivatives of the function  $e^{x^2}$ ? Circle ALL that apply, or 'NONE' as appropriate.

$$\int_1^{x^2} \frac{e^t}{2t} dt$$

$$\int_{\sqrt{2}}^x e^{t^2} dt$$

$$\frac{e^{x^2}}{2x}$$

$$\int_0^{x^2} e^t dt$$

NONE

- b. [4 points] Back in his younger days, Brad hiked to the top of Mount Olympus. Let the continuous function  $T(m)$  denote the rate of change of temperature, in degrees Celsius per meter, after Brad has hiked  $m$  meters. Suppose the following mathematical statements hold:

- $\int_0^{2500} T(m) dm = -25$ .
- $-0.01 = \frac{1}{1000} \int_0^{1000} T(m) dm$ .

Which of the following statements MUST be true? Circle ALL that apply, or 'NONE OF THE ABOVE' as appropriate.

- i)  $T(m)$  is negative for all values of  $m$  in its domain.
- ii) The average rate of change of temperature per meter hiked was the same during the first 1000 meters Brad hiked as it was in the next 1500 meters he hiked.
- iii) During the first 1000 minutes Brad was hiking, the temperature decreased by an average of 0.1 degrees Celsius per minute.
- iv) The temperature decreased by 10 degrees Celsius during the first 1000 meters of Brad's hike.
- v) NONE OF THE ABOVE

- c. [5 points] What is the mass of a solid cube with side length  $\ell$  centimeters if its density  $x$  centimeters above its base is  $x + 1$  grams per cubic centimeter for  $0 \leq x \leq \ell$ . Show all your work including evaluating all integrals and give your answer in terms of  $\ell$ .