Name: $\qquad$ Section: $\qquad$
Answer all questions and show your work. Unsupported answers may receive no credit. You may not use a calculator on this quiz. Allow 15 minutes for the quiz.

1. (4 points) Find the average value of the function $f(x)=\sin (x / 2)$ on the interval $[0, \pi]$.
2. (6 points) Consider the region in the plane $R=\left\{(x, y): 0 \leq y \leq x^{2}, 0 \leq x \leq 2\right\}$.
(a) (1 point) We rotate $R$ about the $x$-axis to obtain a solid $S$. We slice $S$ by the plane perpendicular to the $x$-axis which contains $x=a$. Let $A(a)$ be the area of the resulting cross-section.
Find a formula for $A(a)$ when $0 \leq a \leq 2$.
(b) (2 points) Express the volume of the solid $S$ as an integral. (Do not evaluate the integral.)
(c) (3 points) Let $T$ be the solid obtained by rotating $R$ about the line $y=-1$. Express the volume of $T$ as an integral. (Do not evaluate the integral.)
