

## 2.2 R1

1/1 point (graded)

A hypercube with side length 1 in  $d$  dimensions is defined to be the set of points  $(x_1, x_2, \dots, x_d)$  such that  $0 \leq x_j \leq 1$  for all  $j = 1, 2, \dots, d$ . The boundary of the hypercube is defined to be the set of all points such that there exists a  $j$  for which  $0 \leq x_j \leq .05$  or  $.95 \leq x_j \leq 1$  (namely, the boundary is the set of all points that have at least one dimension in the most extreme 10% of possible values). What proportion of the points in a hypercube of dimension 50 are in the boundary? (hint: you may want to calculate the volume of the non-boundary region)

Please give your answer as a value between 0 and 1 with 3 significant digits. If you think the answer is 50.52%, you should say 0.505:

✓ Answer: 0.995

### Explanation

We know that the volume of the whole hypercube is  $1^{50} = 1$ . The volume of the interior of the hypercube is  $0.9^{50} = 0.005$ . Thus, the volume of the boundary is  $1 - 0.005 = 0.995$ .