Bonus.

d) ~~dist~~

d	avg. distance
1	0.792
2	1.247
4	1.873
8	2.742
16	3.918
32	5.618
64	7.951
128	11.279

As d increases, average distance increases. We can infer that for k-means clustering, it won't work or it has bad performance for a high dimensional space since the volume of the space increases at a great rate relative to increase of dimensions. Average distance to means (centroid) could be too large.

e) the ratio is $(1-\varepsilon)^d$, $(0<\varepsilon<1)$
As d gets large, the ratio becomes small
And $\lim_{d \to \infty} (1-\varepsilon)^d = 0$, the volume of d-dimensional hypercube with side length $1-\varepsilon$ has nearly 0 volume.

For high d, if side length, here distance to the origin is less than 1, samples will be clustered in a very small volume. While the distance is larger than 1, samples will be distributed in a large volume. For random generated multivariate Gaussian samples in such large volume, average distance will increase as d increases since $P(-0.5<x<0.5)$ for a 1d Gaussian Normal is only 38.3%