Problem Set 9

[Your name] and [student ID]
MAT1841-2021

Problem 1 (40 points). Let X be a finite set of points in some Euclidean space and let $r \geq 0$. Prove that $VR(X, r) \subset Cech(X, \sqrt{2}r)$.

Problem 2 (30 points). If K is a p-dimensional simplicial complex and for each k, n_k is the number of k-simplices in K, then the Euler number of K is given by

$$\chi(K) = \sum_{k=0}^{p} (-1)^p n_p.$$

Direclty show that any two triangulations of the circle S^1 have the same Euler number.

Problem 3 (30 points). Construct a simplicial complex with $\beta_2 = 3$, $\beta_1 = 2$, $\beta_0 = 1$. Prove your construction is correct.