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In [28]: import numpy as np
import random
import matplotlib.pyplot as plt
import scipy.stats as sps
from scipy.stats import cumfreq
from scipy.stats import norm
from numpy import histogram
import statsmodels.api as sm
%matplotlib inline

k = 5
N = 10**4
Arr = sps.norm.rvs(size = N)

nums = [10,25,50,100,1000,10000]

def plotEmpiricalDistr(arr, n):
    ecdf = sm.distributions.ECDF(arr)

    x = np.linspace(min(arr), max(arr))
    y = ecdf(x)
    plt.step(x, y)
    plt.plot(x, sps.norm.cdf(x), 'r', label = r'$\aleph(0,1)$')
    plt.show()

for n in nums:
    if n <= N:
        plotEmpiricalDistr(Arr[0:n:], n)

def countD(arr):
    D = []
    for n in range(len(arr)):
        maxVal = 0
        distr_n = np.linspace(min(arr[0:n:]), max(arr[0:n:]))
        for x in arr[0:n:]:
            maxVal = abs(distr_n.cdf(x) - sps.norm.cdf(x))
        D += [maxVal]

    A_X = np.arange(1,len(arr) + 1,1)

    plt.plot(A_X, D, 'c', label = r'$D_{\{n\}} = \sup_{x \in \mathbb{R}} |F_{\{n\}}(x) - F(x)|$')

    plt.xlabel('n')
    plt.ylabel('D(n)')

    plt.legend(loc = 'best')
    plt.show()

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