365 Assignment P3 report

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1 Question 1

1.1 Question 1.1

1.2 Question 1.2

1.3 Question 1.3

Splitting the range calculations into if "A" and if "B" helped a lot as I can just use the direct cdf's, in my previous attempts I was trying to make it without the if's and subtracting BProb from total CDF. Splitting it into if statement is a lot easier.

Another challenge that I encountered was writing code that automatically covered all the files provided in the input list. At first I thought to copy paste and make 4 different blocks of code, one for each input test, but we can automate it by putting them all in a list and iterating over the list. Python makes this easy

with their for "blank" in "blanklist" feature iterating over all elements in the list.

2 Question 2

2.1 Question 2.1

```
Question 1
For input N = 1 DCT matrix is
[[1.]]
For input N = 4 DCT matrix is
[[ 0.5         0.5         0.5         0.5       ]
 [ 0.65328148  0.27059805 -0.27059805 -0.65328148]
 [ 0.5        -0.5        -0.5         0.5       ]
 [ 0.27059805 -0.65328148  0.65328148 -0.27059805]]
For input N = 5 DCT matrix is
[[ 4.47213595e-01  4.47213595e-01  4.47213595e-01  4.47213595e-01
   4.47213595e-01]
 [ 6.01500955e-01  3.71748034e-01  3.87267321e-17 -3.71748034e-01
  -6.01500955e-01]
 [ 5.11667274e-01 -1.95439508e-01 -6.32455532e-01 -1.95439508e-01
   5.11667274e-01]
 [ 3.71748034e-01 -6.01500955e-01 -1.16180196e-16  6.01500955e-01
  -3.71748034e-01]
 [ 1.95439508e-01 -5.11667274e-01  6.32455532e-01 -5.11667274e-01
   1.95439508e-01]]
```

2.2 Question 2.2

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Question 2
For input vector = [0, 1, 2, 3, 4] of size N = 5 DCT transform result is
[ 4.47 -3.15  0.   -0.28 -0.  ]
For input vector = [100, 200, -100, 0, 1, 0] of size N = 6 DCT transform result is
[ 82.06  122.07  100.     0.41 -116.05 -122.07]
For input vector = [0, 0, 0, 0, 0, 0] of size N = 6 DCT transform result is
[0. 0. 0. 0. 0. 0.]
```

2.3 Question 2.3

We need an input that will change very quickly, so let's imitate an oscillating sine wave with step size 1. Meaning vector [0, 1, 0, -1, 0, 1, 0, -1].

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Question 3
For high freq input vector = [ 0  1  0 -1  0  1  0 -1] of size N = 8 DCT transform result is
[ 0.    0.53 -0.    1.09 -1.41 -0.73  0.   -0.11]
```

An example of this in real life is the amplitude of a sound wave, with amplitude being 1.