Homework 4

Problem 4.1 Merge sort

a) Included in the zip file.

b)

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for k = 1
best cases:
Average time for best case: 0.0002

Average cases:
Average time for average case: 0.0003

worst cases:
Average time for worst case: 0.0005

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for k = 2
best cases:
Average time for best case: 0.0005

Average cases:
Average time for average case: 0.0005

worst cases:
Average time for worst case: 0.0005

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for k = 3
best cases:
Average time for best case: 0.0005

Average cases:
Average time for average case: 0.0005

worst cases:
Average time for worst case: 0.0006

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for k = 4
best cases:
Average time for best case: 0.0006

Average cases:
Average time for average case: 0.0006

worst cases:
Average time for worst case: 0.0007

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for k = 5
best cases:
Average time for best case: 0.0007

Average cases:
Average time for average case: 0.0007

worst cases:
Average time for worst case: 0.0007

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```

we notice that it is better to choose a small k for n in range 0-50

Problem 4.2:

a) T(n) = 36T(n/6) + 2n
a = 36;
b = 6;
f(n)= 2n;
n^(log(a)b)= n^(log(36)6) = n^2
Case 1:
Therefore, T(n)=Θ(n^2)

b)T(n) = 5T(n/3) + 17n^(1.2)
a= 5;
b = 3;
f(n) = 17n^(1.2)
n^(log(a)b)= n^(log(5)3) = n^1.46
Case 1:
Therefore, T(n)=Θ(n^1.46)

c)T(n) = 12T(n/2) + n^2 log(n)
a = 12
b = 2
f(n) = n^2 log(n)
n^(log(a)b)= n^(log(12)2) = n^3.58
Case 1:
Therefore, T(n)=Θ(n^3.58)