Question: 5. (5 pts) Assume that function f is in the complexity class 0(N (L...

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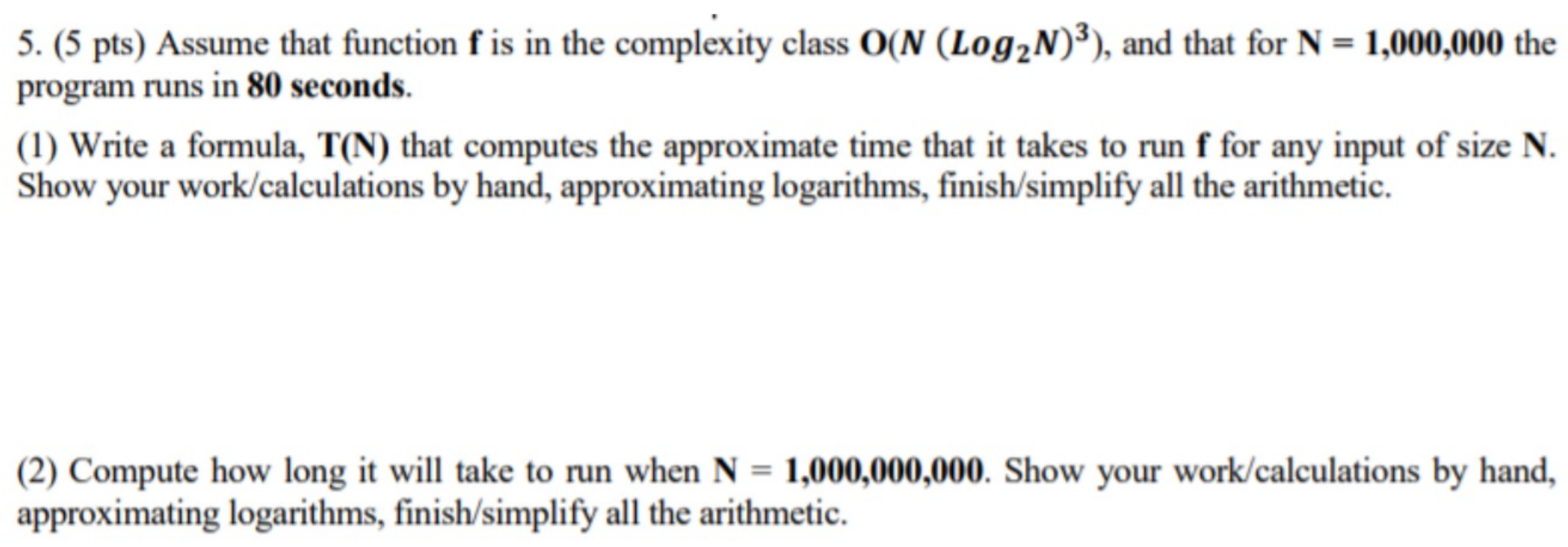

5. (5 pts) Assume that function **f** is in the complexity class **O(*N* (*Log*$_2$*N*)^3)**, and that for **N = 1,000,000** the program runs in **80 seconds**.

(1) Write a formula, **T(N)** that computes the approximate time that it takes to run **f** for any input of size **N**. Show your work/calculations by hand, approximating logarithms, finish/simplify all the arithmetic.

(2) Compute how long it will take to run when **N = 1,000,000,000**. Show your work/calculations by hand, approximating logarithms, finish/simplify all the arithmetic.

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Expert Answer

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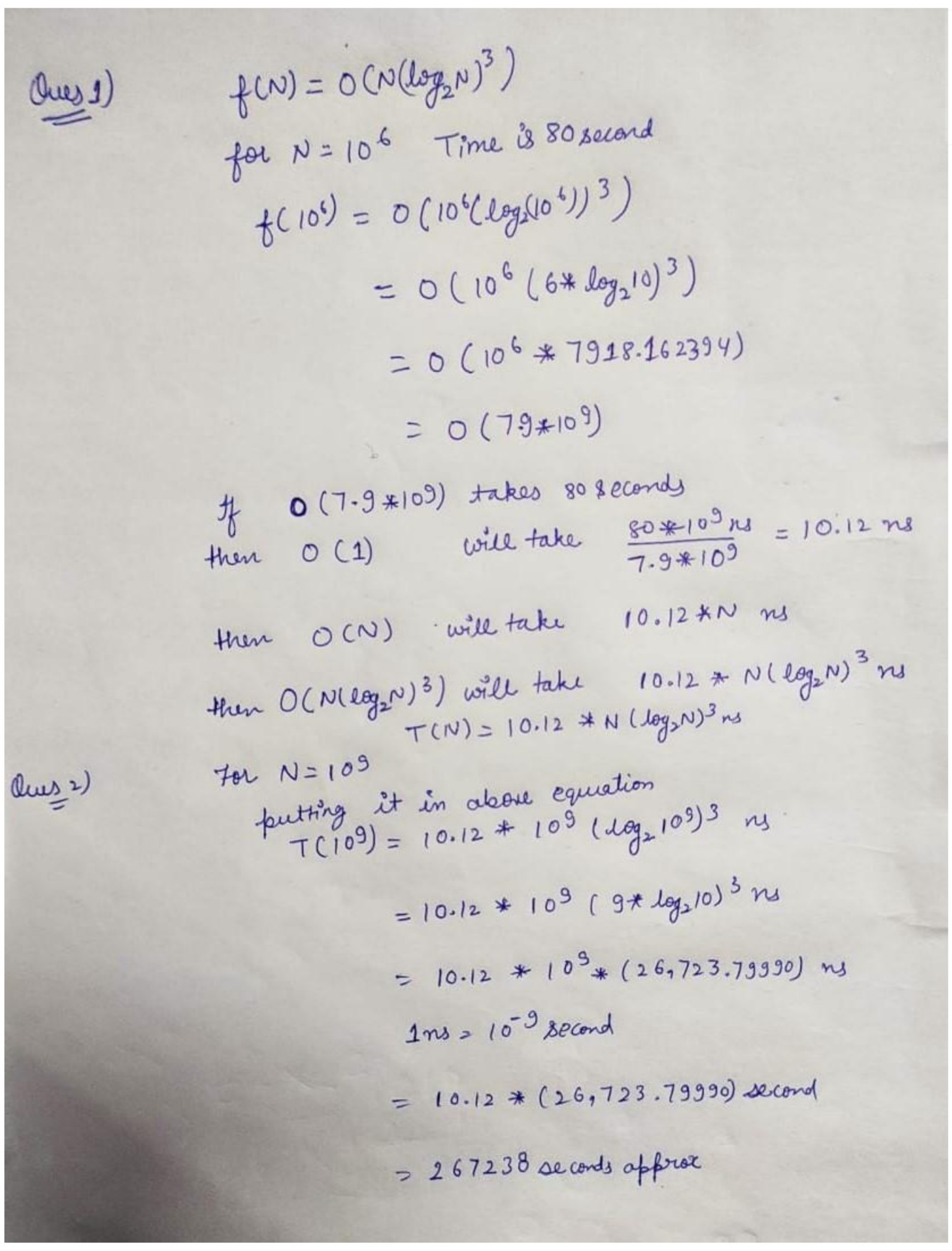

Ques 1)

$f(N) = O(N(\log_2 N)^3)$

for $N = 10^6$ Time is 80 second

$f(10^6) = O(10^6(\log_2(10^6))^3)$

$= O(10^6(6 * \log_2 10)^3)$

$= O(10^6 * 7918.162394)$

$= O(7.9 * 10^9)$

If $O(7.9 * 10^9)$ takes 80 seconds

then $O(1)$ will take $\frac{80 * 10^9 \text{ ns}}{7.9 * 10^9} = 10.12$ ns

then $O(N)$ will take $10.12 * N$ ns

then $O(N(\log_2 N)^3)$ will take $10.12 * N(\log_2 N)^3$ ns

$T(N) = 10.12 * N(\log_2 N)^3$ ns

Ques 2)

For $N = 10^9$

putting it in above equation

$T(10^9) = 10.12 * 10^9(\log_2 10^9)^3$ ns

$= 10.12 * 10^9(9 * \log_2 10)^3$ ns

$= 10.12 * 10^9 * (26{,}723.79990)$ ns

$1 \text{ ns} = 10^{-9}$ second

$= 10.12 * (26{,}723.79990)$ second

$= 267238$ seconds approx

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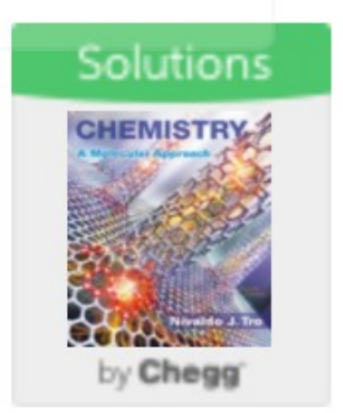

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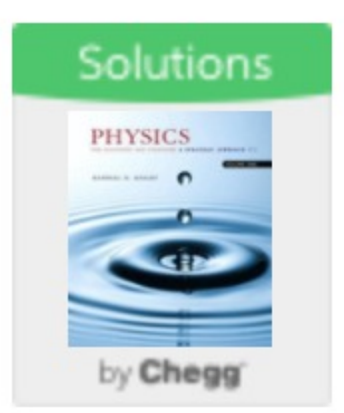

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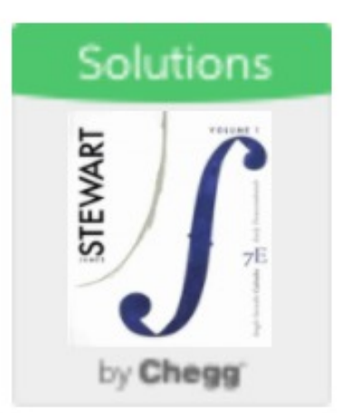

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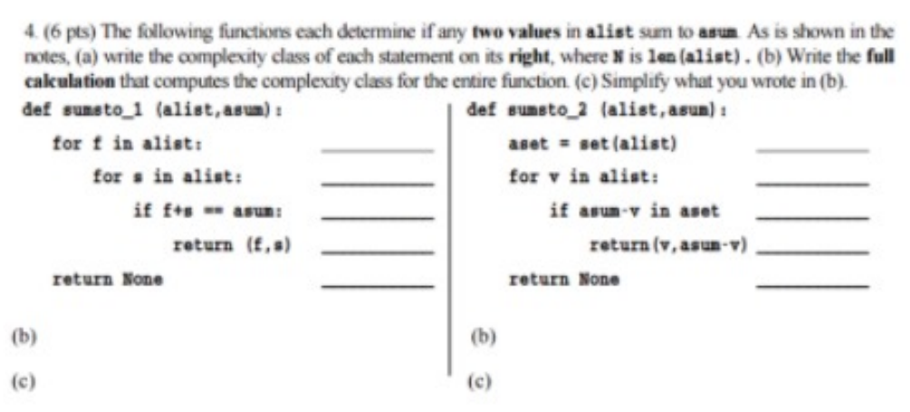
4. (6 pts) The following functions each determine if any two values in alist sum to asum. As is shown in the...



See answer

def selection_sort (arr, start_ix): "Sort arr[start_ic:)." if start_ix >= len(arr) - 1: return min_value, min_ix =...

See answer

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