**Question 5**

We can determine the answer by using the asymptotic notation rules:

**“Big Oh” Notation**: is an abbreviation for

There exists positive constants c and such that

In this case we say that is an asymptotic upper bound for

**“Omega” Notation**: is an abbreviation for

There exists positive constants c and such that

for all

**“Theta Notation**: if and only if

Meaning and have the same asymptotic growth rates

**a)**

We are given:

*Looking at Big Oh Notation,*

Which is true for all

*Now, looking at Omega Notation,*

Which is true for all such that 0

Therefore, for large n, and have the same asymptotic rates, satisfying the Theta Notation

i.e.:

**b)**

Unable to complete as of yet.

**c)**

We are given,

;

Consider the two cases whereby is odd, and whereby is even

i.e.: (odd), (even) for some positive integer, .

**Using the Big Oh Notation for even and odd cases**

*Odd Case:*

*and so*

for

*Even Case:*

*and so*

However, as n tends to infinity, which contradicts our findings and thus rules out the Big Oh Notation.

**Using the Omega Notation for even and odd cases**

*Odd Case:*

for

*Even Case:*

for

Again, as tends to infinity, would grow larger than 1 for our Odd Case. And so we have a contradiction which rules out the Omega Notation.

So, neither the Big Oh nor the Omega Notation fits the functions