BSP Problem 1

Suppose we have a parallel machine based that has measured parameters given as $g = 10ns/word$ and $l = 240ns$. We then replace the network with a new switch that has a higher bisection bandwidth, but otherwise similar performance. Which of these parameters will change and will the parameter increase or decrease? Explain your reasoning.

BSP Problem 2

In class we discussed a one-to-all broadcast that sent messages from one processors to all other processors in using $log(p)$ BSP supersteps using a recursive doubling algorithm. Another algorithm is the all-to-all broadcast which can be naively implemented as p successive one-to-all broadcasts such that each processor starts with one data item and ends with p data items that contains the data provided by each processor. This naive implementation would be performed in $plog(p)$ BSP supersteps. Since these p broadcasts are indepenendent, you could perform the same operation in $log(p)$ BSP supersteps by performing all of the broadcasts at the same time. Describe such an algorithm and derive its running time.

BSP Problem 3

In class we discussed a optimal broadcast algorithm that could adjust to the relative magnitude of the system bandwidth (g) and sytem latency (l). Describe an algorithm that could perform a similar optimization for summing n numbers on p processors. Derive the running time for this algorithm. Assume that l and g is measured in terms of the time it takes to perform one addition operation.