

PROBLEM 4 (50 points)

Consider the following 68000 assembly program

```
00001000          1          ORG          $1000
00001000 00000004  2 NUM          DC.L          $4
00001004 00000001000000003000000  3 DATA      DC.L          $1,$3,$5,$7
00001014          4 RSLT1       DS.L          4
00001024          5 RSLT2       DS.L          1
                                6
00002000          7          ORG          $2000
00002000 207C A0A0A0A0  8          MOVEA.L      #$A0A0A0A0,A0
00002006 227C A1A1A1A1  9          MOVEA.L      #$A1A1A1A1,A1
0000200C 247C A2A2A2A2 10         MOVEA.L      #$A2A2A2A2,A2
00002012 203C D0D0D0D0 11         MOVE.L       #$D0D0D0D0,D0
00002018 223C D1D1D1D1 12         MOVE.L       #$D1D1D1D1,D1
0000201E 4FF9 00008000 13         LEA          $8000,SP
00002024 2F38 1000     14         MOVE.L      NUM,-(SP)
00002028 4878 1004     15         PEA          DATA
0000202C 4878 1014     16         PEA          RSLT1
00002030 4878 1024     17         PEA          RSLT2
00002034 6100 0FCA     18         BSR          MYSUBR
00002038 4FEF 000C     19         LEA          16(SP),SP
0000203C 4E75          20         RTS
                                21
00003000          22         ORG          $3000
00003000 4E52 FFFC     23 MYSUBR LINK      A2,#-4
00003004 257C 00000000 FFFC 24         MOVE.L      #0,-4(A2)
0000300C 48E7 C0C0     25         MOVEM.L     A0-A1/D0-D1,-(SP)
00003010 206A 0010     26         MOVEA.L     16(A2),A0
00003014 226A 000C     27         MOVEA.L     12(A2),A1
00003018 4280     28         CLR.L      D0
0000301A B0AA 0014     29 AGAIN    CMP.L      20(A2),D0
0000301E 6700 0010     30         BEQ          DONE
00003022 2218          31         MOVE.L      (A0)+,D1
00003024 C2C1          32         MULU      D1,D1
00003026 22C1     33         MOVE.L      D1,(A1)+
00003028 D3AA FFFC     34         ADD.L      D1,-4(A2)
0000302C 5240          35         ADDQ      #1,D0
0000302E 60EA          36         BRA          AGAIN
00003030 222A FFFC     37 DONE    MOVE.L      -4(A2),D1
00003034 206A 0008     38         MOVEA.L     8(A2),A0
00003038 2081     39         MOVE.L      D1,(A0)
0000303A 4C9F 0303     40         MOVEM      (SP)+,A0-A1/D0-D1
0000303E 4E5A     41         UNLK      A2
00003040 4E75          42         RTS
00003042          43         END
```

(a) (10/50) Briefly explain the functionality of the program. What mathematical operations are carried out? What are the results? Where is data retrieved? Where are results saved?

(b) (15/50 points) Explain the organization of the stack by blocks, i.e. the location and size of parameters, local variables, stack pointer, stack frame, frame pointer, etc. As an example, the first two items of the stack are shown.



