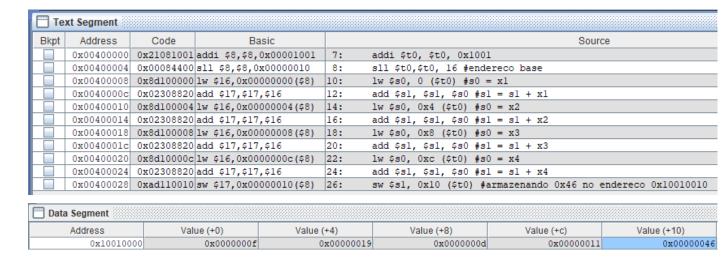
#### Relatório 8

Bernardo Temponi, Diego Arruda, Diogo Araujo, Guilherme Fróes

#### Programa 09



#### Resposta Exercícios:

- 1) C (64 bits);
- B (hi, lo), parte mais significativa é armazenada no registrador hi e a parte menos significativa é armazenada no lo;
- 3) B MULT
- 4) B
- 5) A
- 6) A
- 7) D
- 8) B
- 9) B
- 10)

# Programas 13)

```
.text
.globl main
main:
   addi $t0, $t0, 0x1001
   sll $t0,$t0, 16 #endereco base
   lw $t1, 0x0 ($t0) #t1 = A
   srl $t2, $t1, 31
                             #t2 = ultimo Bit de A
   bne $t2 ,$0 , Negativo
                             # if ($t2 != 0)
                             # (false) go to Fim
   j Fim
Negativo:
   sub $t3, $0, $t2
                             #t3 = -1 se ultimo Bit
  mult $t3, $t1
                             # lo <-- -1A
                             \# \$t1 = -A
   mflo $t1
Fim:
   sw $t1, 0x0 ($t0) #no endereco 0x10010000
.data
A: .word 0x7fffffff
```

Te:	Text Segment									
Bkpt	Address	Code	Basic			Source				
	0x00400000	0x21081001	addi \$8,\$8,4097	15:	addi \$t0, \$t0, 0x1001					
	0x00400004	0x00084400	s11 \$8,\$8,16	16:	sl1 \$t0,\$t0, 16 #endere	co base				
	0x00400008	0x8d090000	lw \$9,0(\$8)	18:	lw \$t1, 0x0 (\$t0)	#t1 = A				
	0x0040000c	0x000957c2	srl \$10,\$9,31	20:	srl \$t2, \$t1, 31	#t2 = ultimo Bit de A				
	0x00400010	0x15400001	bne \$10,\$0,1	22:	bne \$t2 ,\$0 , Negativo	# if (\$t2 != 0)				
	0x00400014	0x08100009	j 0x00400024	23:	j Fim	# (false) go to Fim				
	0x00400018	0x000a5822	sub \$11,\$0,\$10	26:	sub \$t3, \$0, \$t2	#t3 = -1 se ultimo Bit == 1				
	0x0040001c	0x01690018	mult \$11,\$9	27:	mult \$t3, \$t1	# 10 <1A				
	0x00400020	0x00004812	mflo \$9	28:	mflo \$t1	# \$t1 = -A				
	0x00400024	0xad090000	sw \$9,0(\$8)	31:	sw \$t1, 0x0 (\$t0) #no ender	eco 0x10010000				

Registers	Coproc 1	Coproc 0				
Name		N	umber	Value		
\$zero			0	0		
\$at			1	0		
\$v0			2	0		
\$vl			3			
\$a0			4	0		
\$al			5	0		
\$a2			6	0		
\$a3			7	0		
\$t0			8	268500992		
\$t1			9	2147483647		
\$t2			10	0		
\$t3			11	0		
\$t4			12	0		
\$t5			13	0		
\$t6			14			
\$t7			15			
\$80			16			
\$s1			17	0		
\$s2			18	0		
\$83			19	0		
\$84			20	0		
\$85			21	0		
\$86			22	2		
\$87			23			
\$t8			24	0		
\$t9			25	0		
\$k0			26	0		
\$k1			27	0		
\$gp			28	268468224		
\$sp			29	2147479548		
\$fp			30	0		
\$ra			31	0		
рс				4194344		
hi				0		
10				0		

Data Segment				
Address	Value (+0)	Value (+4)		
0x10010000	2147483647	0		
0x10010020	0	0		

```
.text
addi $t9, $0, 0x1001
sll $t9, $t9, 16
```

```
lw $s0, 0($t9)
addi $t0, $0, 0x1E
slt $s1, $t0, $s0  # $s1 -> $t0 < $s0
bne $s1, $0, true1  # if s1 != 0 (eh verdadeiro) :
true1
beq $s0, $t0, true1  # if $s0 == $t0 : true1
j flag0
                    # else : flag0
true1:
     addi $t1, $0, 0x32 # t1 -> 0x32 (50)
     slt $s1, $s0, $t1  # s1 -> $s0 < $t1
    beq $s1, $0, false # if $s1 == 0 (eh maior)
    j flag1
false:
     bne $s0, $t1, flag0 # if $s0 != $t1 : FIM
    j flag1
flag1:
    addi $s3, $0, 0x1
    sw $s3, 4($t9)
    j FIM
flag0:
     addi $s3, $0, 0x0
    sw $s3, 4($t9)
    j FIM
FIM:
.data
TEMP: .word 50 # 0x1001000
```

#### FLAG: .word -1 # 0x1001004

Te	xt Segment				
Bkpt	Address	Code	Basic		Source
	0x00400000	0x20191001	addi \$25,\$0,4097	3:	addi \$t9, \$0, 0x1001
	0x00400004	0x0019cc00	s11 \$25,\$25,16	4:	sll \$t9, \$t9, 16
	0x00400008	0x8f300000	lw \$16,0(\$25)	6:	lw \$s0, 0(\$t9)
	0x0040000c	0x2008001e	addi \$8,\$0,30	8:	addi \$t0, \$0, 0x1E
	0x00400010	0x0110882a	slt \$17,\$8,\$16	9:	slt \$s1, \$t0, \$s0  # \$s1 -> \$t0 < \$s0
	0x00400014	0x16200002	bne \$17,\$0,2	10:	bne \$sl, \$0, truel # if sl != 0 (eh verdadeiro) : truel
	0x00400018	0x12080001	beq \$16,\$8,1	11:	beq \$s0, \$t0, truel # if \$s0 == \$t0 : truel
	0x0040001c	0x08100011	j 0x00400044	12:	j flag0 # else : flag0
	0x00400020	0x20090032	addi \$9,\$0,50	15:	addi \$t1, \$0, 0x32 # t1 -> 0x32 (50)
	0x00400024	0x0209882a	slt \$17,\$16,\$9	16:	slt \$sl, \$s0, \$tl # sl -> \$s0 < \$tl
	0x00400028	0x12200001	beq \$17,\$0,1	17:	beq \$s1, \$0, false # if \$s1 == 0 (eh maior)
	0x0040002c	0x0810000e	j 0x00400038	18:	j flagl
	0x00400030	0x16090004	bne \$16,\$9,4	21:	bne \$s0, \$t1, flag0   # if \$s0 != \$t1 : FIM
	0x00400034	0x0810000e	j 0x00400038	22:	j flagl
	0x00400038	0x20130001	addi \$19,\$0,1	25:	addi \$s3, \$0, 0x1
	0x0040003c	0xaf330004	sw \$19,4(\$25)	26:	sw \$s3, 4(\$t9)
	0x00400040	0x08100014	j 0x00400050	27:	j FIM
	0x00400044	0x20130000	addi \$19,\$0,0	30:	addi \$s3, \$0, 0x0
	0x00400048	0xaf330004	sw \$19,4(\$25)	31:	sw \$s3, 4(\$t9)
	0x0040004c	0x08100014	j 0x00400050	32:	j FIM

Registers Coproc 1	Coproc 0			
Name	Number	Value		
\$zero	0	0		
\$at	1			
\$v0	2	0		
\$vl	3			
\$a0	4	0		
\$al	5			
\$a2	6	0		
\$a3	7			
\$t0	8	30		
\$t1	9	50		
\$t2	10	0		
\$t3	11	. 0		
\$t4	12	0		
\$t5	13	0		
\$t6	14	0		
\$t7	15	0		
\$80	16	50		
\$sl	17	7		
\$s2	18			
\$83	19			
\$84	20	0		
\$85	21	. 0		
\$86	22	. 0		
\$87	23	0		
\$t8	24	0		
\$t9	25	268500992		
\$k0	26	0		
\$kl	27	0		
\$gp	28	268468224		
\$sp	29	2147479548		
\$fp	30	0		
\$ra	31	. 0		
pc		4194384		
hi		0		
10		0		

Data Segment			
Address	Value (+0)	Value (+4)	Value (+8)
0x10010000	50	1	0
0x10010020	0	0	0

```
.text
addi $t0, $0, 0x1001
sll $t0, $t0, 16
lw $s0, 0($t0)
```

```
addi $t1, $0, 0x0 # contador($t1) -> 0
addi $t2, $0, 0x64 # tam -> 0x64 (100)
j LOOP
LOOP:
   sll $s1, $t1, 1 # 2*i
   addi $s1, $s1, 0x1 # 2*i + 1
   sw $s1, 0($t0)
   addi $t0, $t0, 0x4 # $t0 -> $t0 + 4
   addi $t1, $t1, 0x1 # $t1 -> $t1 + 1 (contador)
   bne $t1, $t2, LOOP # if $t1 != $t2 : LOOP
   j SOMA
SOMA:
  addi $t0, $0, 0x1001
  sll $t0, $t0, 16
  addi $t1, $0, 0x0 # contador($t1) -> 0
  addi $t2, $0, 0x64 \# tam -> 0x64 (100)
  addi $s0, $0, 0x0 # valor inicial da soma
  j LOOP2
LOOP2:
  lw $t3, 0($t0)
  add $s0, $s0, $t3
```

```
addi $t0, $t0, 0x4 # $t0 -> $t0 + 4 (endereço)
addi $t1, $t1, 0x1 # $t1 -> $t1 + 1 (contador)

bne $t1, $t2, LOOP2 # if $t1 != $t2 : LOOP
j FIM

FIM:
   sw $s0, 0($t0)

.data
vetor: .word 0 # 0x1001000
```

Te:	xt Segment			
Bkpt	Address	Code	Basic	Source
	0x00400000	0x20081001	addi \$8,\$0,4097	2: addi \$t0, \$0, 0x1001
	0x00400004	0x00084400	sll \$8,\$8,16	3: sll \$t0, \$t0, 16
	0x00400008	0x8d100000	lw \$16,0(\$8)	5: lw \$s0, 0(\$t0)
	0x0040000c	0x20090000	addi \$9,\$0,0	7: addi \$t1, \$0, 0x0 # contador(\$t1) -> 0
	0x00400010	0x200a0064	addi \$10,\$0,100	8: addi \$t2, \$0, 0x64 # tam -> 0x64 (100)
	0x00400014	0x08100006	j 0x00400018	9: j LOOP
	0x00400018	0x00098840	sll \$17,\$9,1	12: sll \$sl, \$tl, l # 2*i
	0x0040001c	0x22310001	addi \$17,\$17,1	13: addi \$s1, \$s1, 0x1 # 2*i + 1
	0x00400020	0xad110000	sw \$17,0(\$8)	15: sw \$s1, 0(\$t0)
	0x00400024	0x21080004	addi \$8,\$8,4	16: addi \$t0, \$t0, 0x4 # \$t0 -> \$t0 + 4
	0x00400028	0x21290001	addi \$9,\$9,1	18: addi \$t1, \$t1, 0x1 # \$t1 -> \$t1 + 1 (contador)
	0x0040002c	0x152afffa	bne \$9,\$10,-6	20: bne \$t1, \$t2, LOOP # if \$t1 != \$t2 : LOOP
	0x00400030	0x0810000d	j 0x00400034	21: j SOMA
	0x00400034	0x20081001	addi \$8,\$0,4097	24: addi \$t0, \$0, 0x1001
	0x00400038	0x00084400	sll \$8,\$8,16	25: sll \$t0, \$t0, 16
	0x0040003c	0x20090000	addi \$9,\$0,0	27: addi \$t1, \$0, 0x0 # contador(\$t1) -> 0
	0x00400040	0x200a0064	addi \$10,\$0,100	28: addi \$t2, \$0, 0x64 # tam -> 0x64 (100)
	0x00400044	0x20100000	addi \$16,\$0,0	30: addi \$s0, \$0, 0x0 # valor inicial da soma
	0x00400048	0x08100013	j 0x0040004c	32: j LOOP2
	0x0040004c	0x8d0b0000	lw \$11,0(\$8)	36: lw \$t3, 0(\$t0)
	0x00400050	0x020b8020	add \$16,\$16,\$11	37: add \$s0, \$s0, \$t3
	0x00400054	0x21080004	addi \$8,\$8,4	39: addi \$t0, \$t0, 0x4 # \$t0 -> \$t0 + 4 (endereço)
	0x00400058	0x21290001	addi \$9,\$9,1	40: addi \$t1, \$t1, 0x1 # \$t1 -> \$t1 + 1 (contador)
	0x0040005c	0x152afffb	bne \$9,\$10,-5	42: bne \$t1, \$t2, LOOP2 # if \$t1 != \$t2 : LOOP
	0x00400060	0x08100019	j 0x00400064	43: j FIM
	0x00400064	0xad100000	sw \$16,0(\$8)	46: sw \$s0, 0(\$t0)

Registers Coproc 1	Coproc 0				
Name	N	umber	Value		
\$zero		0	0		
\$at		1	0		
\$v0		2	0		
\$v1		3	0		
\$a0		4	0		
\$al		5	0		
\$a2		6	0		
\$a3		7	0		
\$t0		8	268501392		
\$t1		9	100		
\$t2		10	100		
\$t3		11	199		
\$t4		12	0		
\$t5		13	0		
\$t6		14	0		
\$t7		15	0		
\$s0		16	10000		
\$sl		17	199		
\$s2		18	0		
\$ <b>s</b> 3		19	0		
\$s4		20	0		
\$s5		21	0		
\$86		22	2		
\$87		23	0		
\$t8		24	0		
\$t9		25	0		
\$k0		26	0		
\$kl		27	0		
\$gp		28	268468224		
\$sp		29	2147479548		
\$fp		30	0		
\$ra		31	0		
pc			4194408		
hi			0		
10			0		

Data Segment									
Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)	
0x10010000	1	3	5	7	9	11	13	15	
0x10010020	17	19	21	23	25	27	29	31	
0x10010040	33	35	37	39	41	43	45	47	
0x10010060	49	51	53	55	57	59	61	63	
0x10010080	65	67	69	71	73	75	77	79	
0x100100a0	81	83	85	87	89	91	93	95	
0x100100c0	97	99	101	103	105	107	109	111	
0x100100e0	113	115	117	119	121	123	125	127	
0x10010100	129	131	133	135	137	139	141	143	
0x10010120	145	147	149	151	153	155	157	159	
0x10010140	161	163	165	167	169	171	173	175	
0x10010160	177	179	181	183	185	187	189	191	
0x10010180	193	195	197	199	10000	0	0	0	
	-	-1	-1	-	-	-	-1	-	

```
.text
addi $t0, $0, 0x1001
sll $t0, $t0, 16
lw $s0, 0($t0)
addi $t1, $0, 0x0 # contador($t1) -> 0
addi $t2, $0, 0x64 # tam -> 0x64 (100)
addi $t3, $0, 0x64 # aux -> 0x64 (100)
j LOOPCriarVetor
LOOPCriarVetor: # colocar elementos no vetor (decrescente
   sw $t3, 0($t0)
    addi $t0, $t0, 0x4 # $t0 -> $t0 + 4
   addi $t1, $t1, 0x1 # $t1 -> $t1 + 1 (contador)
    addi $t3, $t3, -0x1 # $t3--
   bne $t1, $t2, LOOPCriarVetor # if $t1 != $t2 : LOOP
   j BubbleSort
BubbleSort:
        addi $t1, $0, 0x0 # contador (i)
   j LOOP1 # mais interno
LOOP1:
   addi $t4, $0, 0x0 # j = 0
    sub $t3, $t2, $t1 # parada -> tam-i
    j LOOP2 # mais externo
CONTINUE:
```

```
addi $t1, $t1, 0x1 # i++
   bne $t1, $t2 LOOP1 #
   j FIM
LOOP2:
  addi $t8, $0, 0x1001 # controle de acesso a mem
  sll $t8, $t8, 16 # MEM [ J ]
  addi $t9, $t8, 0x4 # MEM [ J + 1 ]
  FOR:
     lw $s0, 0($t8) # $s0 -> MEM[J]
     lw $s1, 0($t9) # $s0 -> MEM[J+1]
     # if MEM [ J + 1 ] < MEM [ J ] :
     slt $t5, $s1, $s0
     bne $t5, $0, SWAP # if true
     CONTINUE FOR:
     addi $t8, $t8, 0x4 \# MEM[J] = MEM[J+1]
     addi $t9, $t9, 0x4 \# MEM[J+1] = MEM[J+1+1]
     addi $t4, $t4, 0x1 # j++
     bne $t4, $t3, FOR # if -> j != tam-i(parada)
  j CONTINUE
SWAP:
  sw $s1, 0($t8)
  sw $s0, 0($t9)
  j CONTINUE FOR
FIM:
.data
vetor: .word 0 # 0x1001000
```

Bkpt	Address	Code	Basic		Source
	0x00400000	0x20081001	addi \$8,\$0,4097	2:	addi \$t0, \$0, 0x1001
	0x00400004	0x00084400	sll \$8,\$8,16	3:	sll \$t0, \$t0, 16
	0x00400008	0x8d100000	lw \$16,0(\$8)	5:	lw \$s0, 0(\$t0)
	0x0040000c	0x20090000	addi \$9,\$0,0	7:	addi \$t1, \$0, 0x0 # contador(\$t1) -> 0
	0x00400010	0x200a0064	addi \$10,\$0,100	8:	addi \$t2, \$0, 0x64 # tam -> 0x64 (100)
	0x00400014	0x200b0064	addi \$11,\$0,100	9:	addi \$t3, \$0, 0x64 # aux -> 0x64 (100)
	0x00400018	0x08100007	j 0x0040001c	10:	j LOOPCriarVetor
	0x0040001c	0xad0b0000	sw \$11,0(\$8)	13:	sw \$t3, 0(\$t0)
	0x00400020	0x21080004	addi \$8,\$8,4	15:	addi \$t0, \$t0, 0x4 # \$t0 -> \$t0 + 4
	0x00400024	0x21290001	addi \$9,\$9,1	16:	addi \$t1, \$t1, 0x1 # \$t1 -> \$t1 + 1 (contador)
	0x00400028	0x216bffff	addi \$11,\$11,-1	17:	addi \$t3, \$t3, -0x1 # \$t3
	0x0040002c	0x152afffb	bne \$9,\$10,-5	19:	bne \$t1, \$t2, LOOPCriarVetor # if \$t1 != \$t2 : LOO
	0x00400030	0x0810000d	j 0x00400034	20:	j BubbleSort
	0x00400034	0x20090000	addi \$9,\$0,0	23:	addi \$tl, \$0, 0x0 # contador (i)
	0x00400038	0x0810000f	j 0x0040003c	24:	j LOOP1 # mais interno
	0x0040003c	0x200c0000	addi \$12,\$0,0	27:	addi \$t4, \$0, 0x0 # j = 0
	0x00400040	0x01495822	sub \$11,\$10,\$9	28:	sub \$t3, \$t2, \$t1 # parada -> tam-i
	0x00400044	0x08100015	j 0x00400054	29:	j LOOP2 # mais externo
	0x00400048	0x21290001	addi \$9,\$9,1	32:	addi \$t1, \$t1, 0x1 # i++
	0x0040004c	0x152afffb	bne \$9,\$10,-5	33:	bne \$t1, \$t2 LOOP1 #
	0x00400050	0x08100024	j 0x00400090	34:	j FIM
	0x00400054	0x20181001	addi \$24,\$0,4097	37:	addi \$t8, \$0, 0x1001 # controle de acesso a mem
	0x00400058	0x0018c400	sll \$24,\$24,16	38:	sll \$t8, \$t8, 16 # MEM [ J ]
	0x0040005c	0x23190004	addi \$25,\$24,4	39:	addi \$t9, \$t8, 0x4 # MEM [ J + 1 ]
	0x00400060	0x8f100000	lw \$16,0(\$24)	42:	lw \$s0, 0(\$t8) # \$s0 -> MEM[J]
	0x00400064	0x8f310000	lw \$17,0(\$25)	43:	lw \$s1, 0(\$t9) # \$s0 -> MEM[J+1]
	0x00400068	0x0230682a	slt \$13,\$17,\$16	46:	slt \$t5, \$sl, \$s0
	0x0040006c	0x15a00005	bne \$13,\$0,5	47:	bne \$t5, \$0, SWAP # if true
	0x00400070	0x23180004	addi \$24,\$24,4	50:	addi \$t8, \$t8, 0x4 # MEM[J] = MEM[J+1]
	0x00400074	0x23390004	addi \$25,\$25,4	51:	addi \$t9, \$t9, 0x4 # MEM[J+1] = MEM[J+1+1]
	0x00400078	0x218c0001	addi \$12,\$12,1	52:	addi \$t4, \$t4, 0xl # j++
	0x0040007c	0x158bfff8	bne \$12,\$11,-8	53:	bne \$t4, \$t3, FOR # if -> j != tam-i(parada)
	0x00400080	0x08100012	j 0x00400048	54:	j CONTINUE
	0x00400084	0xaf110000	sw \$17,0(\$24)	57:	sw \$sl, 0(\$t8)
	0x00400088	0xaf300000	sw \$16,0(\$25)	58:	sw \$s0, 0(\$t9)
	0x0040008c	0x0810001c	j 0x00400070	59:	j CONTINUE FOR

Registers Coproc 1	Coproc 0	
Name	Number	Value
\$zero	0	0
\$at	1	0
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$al	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	268501392
\$t1	9	100
\$t2	10	100
\$t3	11	1
\$t4	12	
\$t5	13	1 1 0
\$t6	14	
\$t7	15	0
\$30	16	1
\$s1	17	0
\$s2	18	0
\$33	19	0
\$84	20	0
\$85	21	0
\$86	22	0
\$87	23	0
\$t8	24	268500996
\$t9	25	268501000
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194448
hi		0
10		0

Data Segr	Data Segment											
Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)				
0x10010040	16	17	18	19	20	21	22	23				
0x10010060	24	25	26	27	28	29	30	31				
0x10010080	32	33	34	35	36	37	38	39				
0x100100a0	40	41	42	43	44	45	46	47				
0x100100c0	48	49	50	51	52	53	54	55				
0x100100e0	56	57	58	59	60	61	62	63				
0x10010100	64	65	66	67	68	69	70	71				
0x10010120	72	73	74	75	76	77	78	79				
0x10010140	80	81	82	83	84	85	86	87				
0x10010160	88	89	90	91	92	93	94	95				
0x10010180	96	97	98	99	100	0	0	0				

```
.text
addi $t0, $0, 0x1001
sll $t0, $t0, 16
lw $s0, 0($t0) # $s0 -> x
div $t0, $s0, 0x2
mfhi $t0 # resto da divisao
beq $t0, $0, PAR
j IMPAR
PAR:
   # x^4
   addi $t8, $0, 0x3 # contador = expoente-1
   addi $t1, $s0, 0x0
   LOOP ELEVAR1: # return -> $t1
       mult $s0, $t1
       mflo $t1
       addi $t8, $t8, -0x1 # contador--
       bne $t8, $t0, LOOP ELEVAR1
   addi $s2, $t1, 0x0
   \# x^3
   addi $t8, $0, 0x2 # contador = expoente-1
   addi $t1, $s0, 0x0
   LOOP ELEVAR2: # return -> $t1
      mult $s0, $t1
       mflo $t1
       addi $t8, $t8, -0x1 # contador--
       bne $t8, $t0, LOOP ELEVAR2
   add $s2, $s2, $t1
```

```
# 2*x^2
  addi $t8, $0, 0x1 # contador = expoente-1
  addi $t1, $s0, 0x0
  LOOP ELEVAR3: # return -> $t1
      mult $s0, $t1
      mflo $t1
      addi $t8, $t8, -0x1 # contador--
      bne $t8, $t0, LOOP ELEVAR3
  sll $t1, $t1, 1 # x^2 * 2
  sub $s2, $s2, $t1 # <math>x^4 + x^3 - 2*x^2
  j FIM
IMPAR:
  # x^5
  addi $t8, $0, 0x5 # contador = expoente
  addi $t1, $s0, 0x0
  LOOP ELEVAR4: # return -> $t1
      mult $s0, $t1
      mflo $t1
      addi $t8, $t8, -0x1 # contador--
      bne $t8, $t0, LOOP ELEVAR4
  addi $s2, $t1, 0x0
  # x^3
  addi $t8, $0, 0x3 # contador = expoente
  addi $t1, $s0, 0x0
  LOOP ELEVAR5: # return -> $t1
      mult $s0, $t1
      mflo $t1
```

```
addi $t8, $t8, -0x1 # contador--
bne $t8, $t0, LOOP_ELEVAR5

sub $s2, $s2, $t1
addi $s2, $s2, 0x1
j FIM

FIM:
addi $t0, $0, 0x1001
sll $t0, $t0, 16
sw $s2, 4($t0)

.data
x: .word 3 # 0x1001000
y: .word -1 # 0x1001004
```

sll \$6,80,16		
### \$11 \$0,80,16  ### \$20,0 (\$10) # \$50 - x  ### \$24,50,1  ### \$21 \$25,0  ### \$21,50,1	Basic	Source
1w 516,0(5)	addi \$8,\$0,4097	2: addi \$t0, \$0, 0x1001
addi 1,50,2 div \$16,\$1  mflo \$8  mfhi \$8  7: mfhi \$t0 \$ resto \$a divisao beg \$8,\$0,1 9: beg \$50,\$0,1 18: addi \$24,\$0,0 mult \$16,\$9 17: mult \$80,000 mult \$16,\$9 18: mflo \$10 mult \$24,\$0,0 mult \$16,\$9 18: mflo \$10 addi \$24,\$0,1 19: addi \$24,\$0,0 mult \$16,\$9 18: mflo \$10 addi \$24,\$24,-1 19: addi \$24,\$0,0 addi \$24,\$0,0 addi \$24,\$0,0 addi \$24,\$0,0 addi \$24,\$0,0 addi \$24,\$0,0 addi \$24,\$0,1 addi \$25,\$0 addi \$24,\$0,0 addi \$24,\$0,0 addi \$24,\$0,0 addi \$25,\$0 addi \$25,\$0 addi \$25,\$0 addi \$26,\$0 addi \$26,	sll \$8,\$8,16	3: sll \$t0, \$t0, 16
mflo \$8  mflo \$8  7: mfhi \$t0 \$ resto da divisao  beg \$8,00,1  9: beg \$t0, 00, PAR  j 0x00400080  10: j IMPAR  addi \$24,\$0,3  14: addi \$t8, \$0, 0x3 \$ contador = expoente-1  addi \$24,\$0,3  14: milt \$80, \$0; low  milt \$16,\$9  17: milt \$80, \$0; low  milt \$16,\$9  18: milt \$81, \$0, 0x0  milt \$16,\$9  18: milt \$81, \$0, 0x1 \$ contador  be \$24,\$24,-1  19: addi \$t8, \$t8, -0x1 \$ contador  be \$24,\$2,\$-4  20: be \$t8, \$t0, LOOP ELEVAR1  addi \$18,\$9,0  addi \$24,\$0,2  addi \$25,\$10,0x0  addi \$24,\$0,2  addi \$25,\$10,0x0  addi \$24,\$0,2  addi \$25,\$10,0x0  addi \$24,\$24,-1  29: addi \$t8,\$0,0x0  milt \$16,\$9  27: mult \$80,\$t1  milo \$9  addi \$24,\$24,-1  29: addi \$t8,\$10,0x1 \$ contador  be \$24,\$2,-4  30: be \$t8,\$10,0x1 \$ contador  be \$24,\$2,-4  30: addi \$25,\$10,0x0  addi \$24,\$10,1  addi \$24,\$10,1  34: addi \$25,\$10,0x0  milt \$16,\$9  38: addi \$21,\$20,0x1  addi \$24,\$24,-1  39: addi \$24,\$20,0x1  addi \$24,\$24,-1  39: addi \$25,\$10,0x0  milt \$16,\$9  38: mflo \$t1  addi \$24,\$24,-1  39: addi \$24,\$24,-1  addi \$24,\$24,-1  api: addi \$24,\$24,-1  api: addi \$25,\$10,0x0  milt \$16,\$9  38: addi \$25,\$25,\$11  addi \$24,\$24,-1  api: addi \$24,\$24,-1  api: addi \$24,\$24,-1  api: addi \$25,\$25,\$21  addi \$25,\$25,\$21  addi \$24,\$24,-1  api: addi \$24,\$24,-1  api: addi \$25,\$25,\$21  addi \$24,\$24,-1  api: addi \$25,\$25,\$21 \$ addi \$25,\$25,\$21 \$ addi \$25,\$25,\$25,\$25,\$25,\$25,\$25,\$25,\$25,\$25,	lw \$16,0(\$8)	5: lw \$s0, 0(\$t0) # \$s0 -> x
mfile \$8  7: mfhi \$t0 \$ reste da divisao beq \$8,0,1 9: beq \$t0, \$0, PAR  ] 0x00400080 10: ] IMPAR  addi \$24,\$0,3 14: addi \$t8, \$0, 0x3 \$ contador = expoente-1 addi \$24,\$0,3 14: addi \$t8, \$0, \$0x3 \$ contador = expoente-1 addi \$24,\$0,6 mult \$16,\$9 17: mult \$s0,\$ \$t1 mult \$s0,\$ \$t1 mult \$s0,\$ \$t1  addi \$24,\$24,-1 19: addi \$t1,\$ \$t0,\$ \$0x1 \$ contador bne \$24,\$8,-4 20: bne \$t8,\$ \$t0,\$ LOOP ELEVARI addi \$24,\$0,2 24: addi \$s2,\$ \$t1,\$ 0x0 addi \$24,\$0,2 24: addi \$t8,\$ \$0,\$ 0x2 \$ contador = expoente-1 addi \$24,\$0,2 24: addi \$t1,\$ \$t0,\$ \$t0  mult \$16,\$9 27: mult \$s0,\$ \$t1  mult \$16,\$9 28: mflo \$t1  addi \$24,\$24,-1 29: addi \$t1,\$ \$t0,\$ \$t0 PELEVARI addi \$24,\$24,-1 29: addi \$t1,\$ \$t0,\$ \$t0 PELEVARI addi \$24,\$24,-1 29: addi \$t1,\$ \$t0,\$ \$t0 PELEVARI addi \$24,\$0,1 34: addi \$25,\$ \$t1,\$ \$t0 PELEVARI addi \$24,\$0,1 34: addi \$52,\$ \$t2,\$ \$t1  addi \$24,\$0,1 34: addi \$52,\$ \$t2,\$ \$t1  addi \$24,\$0,1 34: addi \$t1,\$ \$t0,\$ \$t0 PELEVARI addi \$24,\$0,1 34: addi \$t1,\$ \$t0,\$ \$t0 PELEVARI addi \$24,\$0,1 34: addi \$t1,\$ \$t0,\$ \$t1  addi \$24,\$0,1 34: addi \$t1,\$ \$t0,\$ \$t0 PELEVARI addi \$24,\$0,1 34: addi \$t1,\$ \$t0,\$ \$t1  addi \$24,\$0,1 34: addi \$t1,\$ \$t	addi \$1,\$0,2	6: div \$t0, \$s0, 0x2
mfhi \$8	div \$16,\$1	
beq \$8,\$0,1	mflo \$8	
0x00400080	mfhi \$8	7: mfhi \$t0 # resto da divisao
addi \$24,\$0,3	beq \$8,\$0,1	9: beq \$t0, \$0, PAR
addi \$9,\$16,0	j 0x00400080	10: j IMPAR
mult \$16,\$9	addi \$24,\$0,3	14: addi \$t8, \$0, 0x3 # contador = expoente-1
mflo \$9  18: mflo \$tl  addi \$24,\$24,-1  19: addi \$t8, \$t8, -0x1 \$contador  bne \$24,\$8,-4  20: bne \$t8, \$t0, LOOP_ELEVAR1  addi \$18,\$9,0  21: addi \$28,\$1,0x0  addi \$24,\$0,2  24: addi \$18,\$0,0x2 \$contador = expoente-1  addi \$24,\$0,2  24: addi \$1,\$30,0x0  mult \$16,\$9  27: mult \$30,\$t1  mflo \$9  28: mflo \$t1  addi \$24,\$24,-1  29: addi \$1,\$10,0x0  addi \$24,\$24,-1  29: addi \$1,\$10,0x0  addi \$24,\$24,-1  29: addi \$24,\$24,0x0  bne \$24,\$22,\$1  addi \$24,\$24,-1  30: bne \$24,\$22,\$2,\$1  addi \$24,\$24,0x0  addi \$24,\$24,-1  31: add \$22,\$22,\$2,\$1  addi \$24,\$0,0x0  mult \$16,\$9  37: mult \$30,\$x01  mflo \$9  38: mflo \$1  addi \$24,\$24,-1  39: addi \$1,\$10,\$10  addi \$24,\$24,-1  50: addi \$1,\$10,\$10  addi \$24,\$24,-1  50: addi \$1,\$30,\$10  addi \$24,\$24,-1  50: addi \$22,\$21,\$10  addi \$24,\$24,-1  50: addi \$22,\$21,\$10  addi \$24,\$24,-1  50: addi \$22,\$21,\$10  addi \$24,\$24,-1  50: a	addi \$9,\$16,0	15: addi \$t1, \$s0, 0x0
addi \$24,\$24,-1  bne \$24,\$9,-4  20:  bne \$t0,\$t0,LOOP_ELEVARI  addi \$24,\$9,0  addi \$24,\$0,2  24:  addi \$24,\$0,0  addi \$24,\$0,2  24:  addi \$t1,\$0,0  xov  mult \$16,\$9  27:  mult \$80,\$t1  mult \$16,\$9  28:  mf10 \$51  addi \$24,\$24,-1  29:  addi \$24,\$24,-1  29:  addi \$24,\$24,-1  30:  bne \$t0,\$t0,LOOP_ELEVARI  addi \$24,\$24,-1  29:  addi \$10,\$10,\$10  xov  bne \$24,\$24,-1  30:  bne \$10,\$10,\$10  bne \$24,\$24,-1  30:  bne \$10,\$10,\$10  addi \$24,\$24,-1  30:  addi \$10,\$10,\$10  31:  addi \$10,\$10,\$10  addi \$24,\$24,0,1  34:  addi \$10,\$10,\$10  35:  addi \$10,\$10,\$10  addi \$24,\$24,-1  39:  addi \$10,\$10,\$10  bne \$24,\$10,\$10  addi \$24,\$24,-1  39:  addi \$10,\$10,\$10  addi \$24,\$24,-1  39:  addi \$10,\$10,\$10  addi \$24,\$24,-1  39:  addi \$10,\$10,\$10  addi \$24,\$24,-1  39:  addi \$24,\$20,\$3  addi \$24,\$20,\$5  addi \$24,\$20,\$6  addi \$24,\$20,\$7	mult \$16,\$9	17: mult \$s0, \$t1
bne \$24,\$\$, -4  20: bne \$t\$, \$t0, LOOP_ELEVAR1  addi \$18,\$9,0  21: addi \$22,\$t1, 0x0  addi \$24,\$0,2  24: addi \$t\$, \$t0, 0x2 \$contador = expoente-1  addi \$24,\$0,2  24: addi \$t\$, \$t0, 0x2 \$contador = expoente-1  addi \$9,\$16,0  25: addi \$t1, \$s0, 0x0  mult \$16,\$9  27: mult \$s0, \$t1  mflo \$9  28: mflo \$t1  addi \$24,\$24,-1  29: addi \$t8, \$t8, -0x1 \$contador  bne \$24,\$8,-4  30: bne \$t8, \$t0, LOOP_ELEVAR2  add \$18,\$18,\$9  31: add \$\$2,\$\$2,\$\$t1  addi \$24,\$0,1  34: addi \$t8, \$t8, \$0, 0x1 \$contador = expoente-1  addi \$24,\$4,0,1  34: addi \$t1, \$s0, 0x0  mult \$16,\$9  37: mult \$s0,\$t1  addi \$24,\$24,-1  39: addi \$t1, \$s0, 0x0  mult \$16,\$9  38: mflo \$t1  addi \$24,\$24,-1  39: addi \$t8, \$t8, -0x1 \$contador  bne \$24,\$8,-4  40: bne \$t8, \$t0, LOOP_ELEVAR3  s11 \$9,\$9,1  42: s11 \$t1, \$t1, \$t1, \$t x^2 *2  sub \$18,\$18,\$9  44: sub \$s2, \$s2, \$t1 \$x^4 + x^3 - 2*x^2  j 0x004000c0  45: j FIM  addi \$24,\$0,5  49: addi \$t1, \$s0, 0x0  mult \$16,\$9  52: mult \$s0, \$t1  mflo \$9  33: mflo \$t1  addi \$24,\$24,-1  54: addi \$t8, \$t8, -0x1 \$contador = expoente  addi \$24,\$24,\$0,5  49: addi \$t1, \$s0, 0x0  mult \$16,\$9  53: mflo \$t1  addi \$24,\$24,-1  54: addi \$t8, \$t8, -0x1 \$contador = expoente  addi \$24,\$24,-1  54: addi \$t8,\$9,0  57: addi \$t8,\$0,0x0  mult \$16,\$9  58: mflo \$t1  addi \$24,\$24,-1  56: addi \$t1, \$s0, 0x0  mult \$16,\$9  68: mflo \$t1  addi \$24,\$24,-1  56: addi \$t1, \$s0, 0x0  mult \$16,\$9  68: mflo \$t1  addi \$24,\$24,-1  56: addi \$t1, \$s0, 0x0  mult \$16,\$9  68: mult \$s0, \$t1  mflo \$9  69: addi \$t8,\$t8, -0x1 \$contador = expoente  addi \$24,\$24,-1  56: addi \$t1, \$s0, 0x0  addi \$24,\$24,-1  57: addi \$t1, \$s0, 0x0  addi \$24,\$24,-1  58: bne \$t8, \$t0, LOOP_ELEVAR4  addi \$t1,\$90, \$t1  addi \$18,\$18,90  68: mult \$s0, \$t1  mflo \$9  69: addi \$t8,\$t8, -0x1 \$contador = expoente  addi \$24,\$24,-1  59: addi \$t1,\$0,\$t1  addi \$t1,\$0,\$	mflo \$9	18: mflo \$t1
addi \$18,\$9,0 21: addi \$s2,\$t1,0x0 addi \$24,\$0,2 24: addi \$t8,\$0,0x2 \$contador = expoente-1 addi \$9,\$16,0 25: addi \$t1,\$50,\$0x0 mult \$16,\$9 27: mult \$50,\$t1 mflo \$9 28: mflo \$t1 addi \$24,\$24,-1 29: addi \$t8,\$t8,-0x1 \$contador bme \$24,\$8,-4 30: bne \$t8,\$t0, LOOP_ELEVAR2 add \$18,\$18,\$9 31: add \$s2,\$s2,\$t1 addi \$24,\$0,1 34: addi \$t8,\$t8,0x0 mult \$16,\$9 37: mult \$50,\$x1 mflo \$9 addi \$24,\$0,1 34: addi \$t1,\$50,\$x0 mult \$16,\$9 37: mult \$50,\$x1 mflo \$9 addi \$24,\$24,-1 39: addi \$t1,\$50,\$x0 mult \$16,\$9 37: mult \$50,\$x1 mflo \$9 addi \$24,\$24,-1 39: addi \$t1,\$50,\$x0 mult \$16,\$9 38: mflo \$t1 addi \$24,\$0,1 42: \$11 \$t1,\$t1,\$t1,\$t2,\$x2,\$x2 sub \$18,\$18,\$9,\$44: sub \$s2,\$s2,\$t1 sub \$18,\$18,\$9,\$44: sub \$s2,\$s2,\$t1 addi \$24,\$x2,\$4,\$5,\$49: addi \$t8,\$t8,\$x3,\$x4,\$x4,\$x3,\$x4,\$x2 sub \$18,\$18,\$9,\$49: addi \$t8,\$x3,\$x4,\$x4,\$x3,\$x4,\$x4,\$x3,\$x4,\$x4,\$x4,\$x4,\$x4,\$x4,\$x4,\$x4,\$x4,\$x4	addi \$24,\$24,-1	19: addi \$t8, \$t8, -0x1 # contador
addi \$24,\$0,2	bne \$24,\$8,-4	20: bne \$t8, \$t0, LOOP_ELEVAR1
addi \$9,\$16,0	addi \$18,\$9,0	21: addi \$s2, \$t1, 0x0
mult \$16,\$9 27: mult \$30,\$tl  mflo \$9 28: mflo \$tl  addi \$24,\$24,-1 29: addi \$t8,\$t8, -0x1 \$ contador  bme \$24,\$8,"  add \$18,\$18,\$9 31: addi \$x8,\$x9, 0x0 ELEVAR2  addi \$18,\$18,\$9 31: addi \$x8,\$0,0x1 \$ contador = expoente-1  addi \$24,\$0,1 34: addi \$t8,\$0,0x0  mult \$16,\$9 37: mult \$30, \$x1  milt \$40,\$18,\$18,\$9  addi \$24,\$24,-1 39: addi \$t1,\$x0,0x0  mult \$16,\$9 38: mflo \$t1  addi \$24,\$24,-1 39: addi \$t8,\$t8, -0x1 \$ contador  bne \$24,\$24,\$-4 40: bne \$t8,\$t0, LOOP_ELEVAR3  sil \$9,\$5,\$1 42: sil \$t1,\$t1, \$t1, \$ \$x^2 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	addi \$24,\$0,2	24: addi \$t8, \$0, 0x2 # contador = expoente-1
mflo \$9  addi \$24,\$24,-1  29: addi \$28, \$18, -0x1 \$ contador  bne \$24,\$8,-4  30: bne \$t8, \$t0, LOOP_ELEVAR2  addi \$24,\$0,1  34: addi \$22,\$2,\$t1  addi \$24,\$0,1  34: addi \$48,\$0,0x0  mult \$16,\$9  37: mult \$50,\$t1  addi \$24,\$24,-1  39: addi \$51,\$50,0x0  mult \$16,\$9  38: mflo \$t1  addi \$24,\$24,-1  39: addi \$t8,\$t8, -0x1 \$ contador  bne \$24,\$8,-4  40: bne \$t8,\$t0, LOOP_ELEVAR3  sll \$9,\$9,1  42: sll \$t1,\$t1,\$t1,\$1 \$ x^2 \$ 2  sub \$18,\$18,\$9  44: sub \$22,\$t1 \$ x^4 + x^3 - 2^*x^2  j 0x004000c0  45: j FIM  addi \$24,\$0,5  addi \$51,\$50,0x0  mult \$16,\$9  52: mult \$50,\$t1  mflo \$9  53: mflo \$t1  addi \$24,\$24,-1  54: addi \$t8,\$t8, -0x1 \$ contador  bne \$24,\$8,-4  55: bne \$t8,\$t0, LOOP_ELEVAR3  sub \$18,\$18,\$19,\$0  addi \$24,\$0,5  addi \$51,\$50,0x0  mult \$16,\$9  52: mult \$50,\$t1  addi \$24,\$24,-1  54: addi \$51,\$50,0x0  addi \$24,\$24,-1  54: addi \$51,\$50,0x0  addi \$24,\$0,3  addi \$24,\$0,3  addi \$24,\$0,3  addi \$24,\$0,3  addi \$24,\$0,3  addi \$51,\$0,0x0  addi \$24,\$0,3  addi \$24,\$0,3  addi \$24,\$0,3  addi \$24,\$0,3  addi \$24,\$0,3  addi \$24,\$0,4  addi \$24,\$0,4  addi \$24,\$0,4  addi \$24,\$0,4  addi \$24,\$0,4  addi \$24,\$0,3  addi \$24,\$0,3  addi \$24,\$0,3  addi \$24,\$0,4  addi \$24,\$0,3  addi \$24,\$0,3  addi \$24,\$0,3  addi \$24,\$0,3  addi \$24,\$0,4  addi \$24,\$0,4  addi \$24,\$0,7  addi \$24,\$0,7  addi \$24,\$0,8  addi \$24,\$0,8  addi \$24,\$0,9  addi \$24,\$0,0  addi	addi \$9,\$16,0	25: addi \$t1, \$s0, 0x0
addi \$24,\$24,-1	mult \$16,\$9	27: mult \$s0, \$t1
bne \$24,\$8,-4  add \$18,\$18,\$9  31: add \$\$2,\$52,\$t1  addi \$24,\$0,1  34: addi \$t8,\$0,0x0  mult \$16,\$9  37: mult \$s0,\$t1  mflo \$9  38: mflo \$t1  addi \$24,\$24,-1  39: addi \$t8,\$t8,\$-0x1 \$contador = expoente-1  addi \$24,\$24,-1  39: addi \$t8,\$t8,\$-0x1 \$contador  bne \$24,\$2,\$-4  40: bne \$t8,\$t0, LOOP_ELEVAR3  311 \$\$9,\$9,1  42: sl1 \$t1,\$t1,\$1 \$\$x^2 \$\$2  sub \$18,\$18,\$9  44: sub \$\$2,\$\$2,\$t1 \$\$x^4 \$\$x^4 \$\$x^3 \$\$-\$2*x^2\$  30x004000c0  45: j FIM  addi \$24,\$0,5  49: addi \$t8,\$0, 0x5 \$contador = expoente  addi \$24,\$0,5  49: addi \$t8,\$0, 0x0  mult \$16,\$9  52: mult \$\$0,\$t1  addi \$24,\$24,-1  54: addi \$t8,\$t8,\$-0x1 \$contador  bne \$24,\$24,-1  54: addi \$t8,\$t8,\$-0x1 \$contador  bne \$24,\$24,-1  55: bne \$t8,\$t0, LOOP_ELEVAR4  addi \$24,\$0,3  60: addi \$t8,\$0, 0x3 \$contador = expoente  addi \$9,\$16,0  61: addi \$t1,\$0,0  mult \$16,\$9  63: mult \$\$0,\$t1  addi \$24,\$24,-1  65: addi \$t8,\$0,0x0  mult \$16,\$9  63: mult \$\$0,\$t1  addi \$24,\$24,-1  65: addi \$t8,\$0,0x0  mult \$16,\$9  64: mflo \$\$1  addi \$24,\$24,-1  65: addi \$t8,\$t8,-0x1 \$contador  bne \$24,\$8,-4  66: bne \$t8,\$t0, LOOP_ELEVAR5  sub \$18,\$18,\$9  68: sub \$22,\$22,\$t1  addi \$18,\$18,\$9  68: sub \$22,\$22,\$t1  addi \$18,\$18,\$19  69: addi \$22,\$22,\$t1  addi \$24,\$0,000  addi \$18,\$0,4097  74: addi \$t0,\$0,0x1001  s11 \$8,\$8,16  75: s11 \$t0,\$t0,16	mflo \$9	28: mflo \$tl
add \$18,\$18,\$9  addi \$24,\$0,1  34: addi \$28,\$0,01 \$contador = expoente-1  addi \$9,\$16,0  35: addi \$t1,\$50,000  mult \$16,\$9  38: mflo \$t1  addi \$24,\$24,-1  39: addi \$t8,\$t0,LOOP_ELEVAR3  sli \$9,\$9,1  dui \$9,\$1,6,0  addi \$18,\$9,\$0, \$1  dui \$18,\$9,\$0, \$1  dui \$18,\$9,\$0, \$1  dui \$18,\$0,\$0, \$1  dui \$18,\$0,\$0  dui \$18,\$1,\$0  dui \$18,\$1,\$0  dui \$18,\$1,\$0  dui \$18,\$1,\$1,\$0  dui \$18,\$0,\$0  To: j FIM  addi \$18,\$0,000  To: j FIM  addi \$10,\$0,00000  dui \$8,\$0,4097  74: addi \$10,\$0,00001	addi \$24,\$24,-1	29: addi \$t8, \$t8, -0xl # contador
addi \$24,\$0,1 34: addi \$t8,\$0,0x1 # contador = expoente-1 addi \$9,\$16,0 35: addi \$t1,\$s0,0x0 mult \$16,\$9 37: mult \$s0,\$t1 mult \$16,\$9 38: mflo \$t1 addi \$24,\$24,-1 39: addi \$t8,\$t8,-0x1 # contador bne \$24,\$8,-4 40: bne \$t8,\$t0, LOOP ELEVAR3 sll \$9,\$9,1 42: sll \$t1,\$t1, l # x^2 * 2 sub \$18,\$18,\$9 44: sub \$s2,\$s2,\$t1 # x^4 + x^3 - 2*x^2 j 0x00400000 45: j FIM addi \$24,\$0,5 49: addi \$t8,\$0,0x5 # contador = expoente addi \$24,\$0,5 49: addi \$t1,\$s0,0x0 mult \$16,\$9 52: mult \$s0,\$t1 addi \$24,\$24,-1 54: addi \$t8,\$t8,-0x1 # contador bne \$24,\$8,-4 55: bne \$t8,\$t0, LOOP ELEVAR4 addi \$18,\$9,0 57: addi \$s2,\$t1,0x0 addi \$24,\$0,3 60: addi \$t8,\$0,0x3 # contador = expoente addi \$9,\$16,0 61: addi \$t1,\$s0,0x0 mult \$16,\$9 63: mult \$s0,\$t1 addi \$9,\$16,0 61: addi \$t1,\$s0,0x0 addi \$24,\$0,3 60: addi \$t8,\$0,0x3 # contador = expoente addi \$9,\$16,0 61: addi \$t1,\$s0,0x0 mult \$16,\$9 63: mult \$s0,\$t1 addi \$24,\$24,-1 65: addi \$t8,\$0,0x3 # contador = expoente addi \$24,\$24,-1 65: addi \$t8,\$0,0x0 addi \$24,\$24,-1 65: addi \$t8,\$t8,-0x1 # contador bne \$24,\$8,-4 66: bne \$t8,\$t0, LOOP ELEVAR5 sub \$18,\$18,\$9,6 68: sub \$s2,\$\$2,\$t1 addi \$18,\$18,\$19,\$9 addi \$18,\$18,\$19,\$9 addi \$18,\$18,\$19,\$9 addi \$8,\$0,4097 74: addi \$t0,\$0,0x1001 sll \$8,\$6,166 75: sll \$t0,\$t0, l66	bne \$24,\$8,-4	30: bne \$t8, \$t0, LOOP_ELEVAR2
addi \$9,\$16,0 35: addi \$tl, \$s0, 0x0 mult \$16,\$9 37: mult \$s0,\$tl mflo \$9 38: mflo \$tl addi \$t24,\$24,-1 39: addi \$t8,\$t8, -0xl \$f contador bne \$24,\$8,-4 40: bne \$t8,\$t0, LOOP_ELEVAR3 sll \$sl,\$fl,\$tl, l \$f x^2 * 2 sub \$fl,\$fl,\$tl, l \$f x^4 + x^3 - 2*x^2 j 0x004000c0 45: j FIM addi \$24,\$0,5 49: addi \$tl,\$s0, 0x5 \$f contador = expoente addi \$9,\$fl,0 50: addi \$tl,\$s0,\$tl mult \$16,\$9 52: mult \$s0,\$tl mult \$16,\$9 53: mflo \$tl addi \$tl,\$fl, l \$fl, l \$	add \$18,\$18,\$9	31: add \$s2, \$s2, \$t1
mult \$16,\$9 38: mflo \$tl  addi \$24,\$24,-1 39: addi \$t8,\$t8, -0xl \$contador  bne \$24,\$8,-4 40: bne \$t8,\$t0, LOOP_ELEVAR3  sll \$9,\$9,1 42: sll \$tl,\$tl, l \$x^2 * 2  sub \$18,\$18,\$9 44: sub \$\$2,\$\$2,\$tl \$x^4 + x^3 - 2*x^2  j 0x004000c0 45: j FIM  addi \$24,\$0,5 49: addi \$t8,\$0, 0x5 \$contador = expoente  addi \$9,\$16,0 50: addi \$tl,\$s0,0x0  mult \$16,\$9 52: mult \$\$80,\$	addi \$24,\$0,1	34: addi \$t8, \$0, 0xl # contador = expoente-1
mflo \$9 addi \$24,\$24,-1 39: addi \$t8, \$t8, -0xl \$ contador bne \$24,\$8,-4 40: bne \$t8, \$t0, LOOP ELEVAR3 sll \$9,\$9,1 42: sll \$t1, \$t1, 1 \$ x^2 * 2 sub \$18,\$18,\$9 44: sub \$\$2,\$2,\$2,\$t1 \$ x^4 + x^3 - 2*x^2 j 0x004000c0 45: j FIM addi \$24,\$0,5 49: addi \$t8,\$0, 0x5 \$ contador = expoente addi \$9,\$16,0 50: addi \$t1, \$s0, 0x0 mult \$16,\$9 52: mult \$s0, \$t1 mflo \$9 addi \$24,\$24,-1 54: addi \$t8, \$t8, -0xl \$ contador bne \$24,\$8,-4 55: bne \$t8,\$t0, LOOP ELEVAR4 addi \$24,\$0,3 60: addi \$t1, \$s0, 0x0 mult \$16,\$9 addi \$24,\$0,3 60: addi \$t8,\$0, 0x3 \$ contador bne \$24,\$0,3 60: addi \$t1, \$s0, 0x0 mult \$16,\$9 61: addi \$t1, \$s0, 0x0 mult \$16,\$9 63: mult \$s0, \$t1 mflo \$9 addi \$24,\$0,3 60: addi \$t1, \$s0, 0x0 mult \$16,\$9 63: mult \$s0, \$t1 mflo \$9 addi \$24,\$0,4 66: bne \$t8,\$t8, -0xl \$ contador bne \$24,\$8,-4 66: bne \$t8,\$t0, LOOP ELEVAR5 sub \$18,\$18,\$9 68: sub \$22,\$2,\$2,\$t1 addi \$18,\$18,\$1 69: addi \$22,\$2,\$2,\$t1 addi \$8,\$0,4097 74: addi \$t0,\$0,0x1001 sl1 \$8,\$8,\$1,6 75: sl1 \$t0,\$t0, 16	addi \$9,\$16,0	
addi \$24,\$24,-1 39: addi \$t8, \$t8, -0xl # contador  bne \$24,\$8,-4 40: bne \$t8, \$t0, LOOP_ELEVAR3  sll \$9,\$9,1 42: sll \$t1, \$t1, 1 # x^2 * 2  sub \$18,\$18,\$9 44: sub \$s2, \$s2, \$t1 # x^4 + x^3 - 2*x^2  j 0x004000c0 45: j FIM  addi \$24,\$0,5 49: addi \$t8, \$0, 0x5 # contador = expoente  addi \$9,\$16,0 50: addi \$t1, \$s0, 0x0  mult \$16,\$9 52: mult \$s0, \$t1  mflo \$9  addi \$24,\$24,-1 54: addi \$t8, \$t8, -0xl # contador  bne \$24,\$8,-4 55: bne \$t8, \$t0, LOOP_ELEVAR4  addi \$18,\$9,0 57: addi \$s2,\$t1, 0x0  addi \$24,\$0,3 60: addi \$t1, \$s0, 0x0  mult \$16,\$9 63: mult \$s0, \$t1  mflo \$9  addi \$9,\$16,0 61: addi \$t1, \$s0, 0x0  mult \$16,\$9 63: mult \$s0, \$t1  mflo \$9  addi \$24,\$24,-1 65: addi \$t8, \$0, 0x3 # contador = expoente  addi \$9,\$16,0 61: addi \$t1, \$s0, 0x0  mult \$16,\$9 63: mult \$s0, \$t1  mflo \$9  addi \$24,\$24,-1 65: addi \$t8, \$t8, -0xl # contador  bne \$24,\$8,-4 66: bne \$t8, \$t0, LOOP_ELEVAR5  sub \$18,\$18,\$9 68: sub \$\$2,\$2,\$t1  addi \$18,\$18,\$9 68: sub \$\$2,\$2,\$t1  j 0x004000c0 70: j FIM  addi \$8,\$0,4097 74: addi \$t0,\$0, 0x1001  s11 \$8,\$8,16 75: sll \$t0,\$t0, l6	mult \$16,\$9	37: mult \$s0, \$t1
bne \$24,\$8,-4 40: bne \$t8,\$t0, LOOP_ELEVAR3  sl1 \$9,\$9,1 42: sl1 \$t1,\$t1, 1 # x^2 * 2  sub \$18,\$18,\$9 44: sub \$\$2,\$\$2,\$\$1 # x^4 + x^3 - 2*x^2  j 0x004000c0 45: j FIM  addi \$24,\$0,5 49: addi \$t8,\$0,0x5 # contador = expoente  addi \$9,\$16,0 50: addi \$t1,\$\$0, 0x0  mult \$16,\$9 52: mult \$\$0,\$t1  addi \$24,\$24,-1 54: addi \$t8,\$t8,-0x1 # contador  bne \$24,\$8,-4 55: bne \$t8,\$t0, LOOP_ELEVAR4  addi \$18,\$9,0 57: addi \$22,\$t1,0x0  addi \$24,\$0,3 60: addi \$t1,\$\$0,0x3 # contador = expoente  addi \$9,\$16,0 61: addi \$t1,\$\$0,0x0  mult \$16,\$9 63: mult \$\$0,\$t1  mflo \$9 64: mflo \$t1  addi \$24,\$24,-1 65: addi \$t8,\$t8,-0x1 # contador  bne \$24,\$8,-4 66: bne \$t8,\$t0, LOOP_ELEVAR5  sub \$18,\$18,\$9 68: sub \$\$2,\$\$2,\$t1  j 0x004000c0 70: j FIM  addi \$8,\$0,4097 74: addi \$t0,\$0,0x1001  sl1 \$8,\$8,16 75: sl1 \$t0,\$t0,16	mflo \$9	38: mflo \$t1
s11 \$9,\$9,1       42:       s11 \$t1, \$t1, 1 # x^2 * 2         sub \$18,\$18,\$9       44:       sub \$s2, \$s2, \$t1 # x^4 + x^3 - 2*x^2         j 0x004000c0       45:       j FIM         addi \$24,\$0,5       49:       addi \$t8, \$0, 0x0         mult \$16,\$9       50:       addi \$t1, \$s0, 0x0         mult \$16,\$9       52:       mult \$s0, \$t1         mflo \$9       53:       mflo \$t1         addi \$24,\$24,-1       54:       addi \$t8, \$t8, -0x1 # contador         bne \$24,\$8,-4       55:       bne \$t8, \$t0, LOOP ELEVAR4         addi \$18,\$9,0       57:       addi \$s2, \$t1, 0x0         addi \$24,\$0,3       60:       addi \$t8, \$0, 0x3 # contador = expoente         addi \$9,\$16,0       61:       addi \$t1, \$s0, 0x0         mult \$16,\$9       63:       mult \$s0, \$t1         mflo \$9       64:       mflo \$t1         addi \$24,\$24,-1       65:       addi \$t8, \$t8, -0x1 # contador         bne \$24,\$8,-4       66:       bne \$t8, \$t0, LOOP ELEVAR5         sub \$18,\$18,\$9       68:       sub \$s2, \$s2, \$t1         addi \$18,\$18,\$1       69:       addi \$\$2,\$\$2,\$\$2,\$\$21         addi \$8,\$0,4097       74:       addi \$t0, \$0, 0x1001         \$11,\$8,\$8,16       75:       \$1,\$00,\$0	addi \$24,\$24,-1	39: addi \$t8, \$t8, -0xl # contador
sub \$18,\$18,\$9       44:       sub \$s2, \$s2, \$t1 \notin x^4 + x^3 - 2*x^2         j 0x004000c0       45:       j FIM         addi \$24,\$0,5       49:       addi \$t8, \$0, 0x5 \notin contador = expoente         addi \$9,\$16,0       50:       addi \$t1, \$s0, 0x0         mult \$16,\$9       52:       mult \$s0, \$t1         mflo \$9       53:       mflo \$t1         addi \$24,\$24,-1       54:       addi \$t8, \$t8, -0x1 \notin contador         bne \$24,\$8,-4       55:       bne \$t8, \$t0, LOOP ELEVAR4         addi \$18,\$9,0       57:       addi \$2,\$1, 0x0         addi \$24,\$0,3       60:       addi \$2,\$0, 0x3 \notin contador = expoente         addi \$24,\$0,3       60:       addi \$t1, \$s0, 0x0         mult \$16,\$9       61:       addi \$t1, \$s0, 0x0         mult \$16,\$9       63:       mult \$s0, \$t1         mflo \$9       64:       mflo \$t1         addi \$24,\$24,-1       65:       addi \$t8, \$t8, -0x1 \notin contador         bne \$24,\$8,-4       66:       bne \$t8, \$t0, LOOP ELEVAR5         sub \$18,\$18,\$1       69:       addi \$s2, \$s2, \$t1         addi \$18,\$18,\$1       69:       addi \$50, \$0, 0x1001         s11 \$8,\$8,\$16       75:       s11 \$t0, \$t0, 16	bne \$24,\$8,-4	40: bne \$t8, \$t0, LOOP_ELEVAR3
<pre>j 0x004000c0</pre>	sll \$9,\$9,1	42: sll \$tl, \$tl, 1 # x^2 * 2
addi \$24,\$0,5	sub \$18,\$18,\$9	44: sub \$s2, \$s2, \$t1 # x^4 + x^3 - 2*x^2
addi \$9,\$16,0	j 0x004000c0	45: j FIM
mult \$16,\$9	addi \$24,\$0,5	49: addi \$t8, \$0, 0x5 # contador = expoente
mflo \$9	addi \$9,\$16,0	50: addi \$t1, \$s0, 0x0
addi \$24,\$24,-1 bne \$24,\$8,-4 55: bne \$t8,\$t0,LOOP_ELEVAR4 addi \$18,\$9,0 57: addi \$\$2,\$t1,0x0 addi \$24,\$0,3 60: addi \$t8,\$0,0x3 # contador = expoente addi \$9,\$16,0 mult \$16,\$9 61: addi \$t1,\$\$0,0x0 mult \$16,\$9 64: mflo \$t1 addi \$t8,\$t8,-0x1 # contador bne \$24,\$24,-1 65: addi \$t8,\$t8,-0x1 # contador bne \$24,\$8,-4 66: bne \$t8,\$t0,LOOP_ELEVAR5 sub \$18,\$18,\$9 68: sub \$\$2,\$\$2,\$\$1 addi \$18,\$18,1 69: addi \$\$2,\$\$2,0x1 j 0x004000c0 70: j FIM addi \$8,\$0,4097 74: addi \$t0,\$0,0x1001 s11 \$8,\$8,16 75: s11 \$t0,\$t0,16	mult \$16,\$9	52: mult \$s0, \$t1
bne \$24,\$8,-4 55: bne \$t8,\$t0, LOOP_ELEVAR4  addi \$18,\$9,0 57: addi \$s2,\$t1,0x0  addi \$24,\$0,3 60: addi \$t8,\$0,0x3 # contador = expoente  addi \$9,\$16,0 61: addi \$t1,\$s0,0x0  mult \$16,\$9 63: mult \$s0,\$t1  mflo \$9 64: mflo \$t1  addi \$24,\$24,-1 65: addi \$t8,\$t8,-0x1 # contador  bne \$24,\$8,-4 66: bne \$t8,\$t0, LOOP_ELEVAR5  sub \$18,\$18,\$9 68: sub \$s2,\$\$2,\$t1  addi \$18,\$18,\$1 69: addi \$s2,\$\$2,0x1  j 0x004000c0 70: j FIM  addi \$8,\$0,4097 74: addi \$t0,\$0,0x1001  s11 \$8,\$8,16 75: s11 \$t0,\$t0,16	mflo \$9	53: mflo \$tl
addi \$18,\$9,0	addi \$24,\$24,-1	54: addi \$t8, \$t8, -0x1 # contador
addi \$24,\$0,3 60: addi \$t8, \$0, 0x3 # contador = expoente  addi \$9,\$16,0 61: addi \$t1, \$s0, 0x0  mult \$16,\$9 63: mult \$s0, \$t1  mflo \$9 64: mflo \$t1  addi \$24,\$24,-1 65: addi \$t8, \$t8, -0x1 # contador  bne \$24,\$8,-4 66: bne \$t8, \$t0, LOOP_ELEVAR5  sub \$18,\$18,\$9 68: sub \$s2, \$s2, \$t1  addi \$18,\$18,\$1 69: addi \$s2, \$s2, 0x1  j 0x004000c0 70: j FIM  addi \$8,\$0,4097 74: addi \$t0, \$0, 0x1001  s11 \$8,\$8,16 75: s11 \$t0, \$t0, 16	bne \$24,\$8,-4	55: bne \$t8, \$t0, LOOP_ELEVAR4
addi \$9,\$16,0 61: addi \$t1, \$s0, 0x0  mult \$16,\$9 63: mult \$s0, \$t1  mflo \$9 64: mflo \$t1  addi \$24,\$24,-1 65: addi \$t8, \$t8, -0x1 # contador  bne \$24,\$8,-4 66: bne \$t8, \$t0, LOOP_ELEVAR5  sub \$18,\$18,\$9 68: sub \$s2, \$s2, \$t1  addi \$18,\$18,1 69: addi \$s2, \$s2, 0x1  j 0x004000c0 70: j FIM  addi \$8,\$0,4097 74: addi \$t0, \$0, 0x1001  s11 \$8,\$8,16 75: s11 \$t0, \$t0, 16	addi \$18,\$9,0	57: addi \$s2, \$t1, 0x0
mult \$16,\$9 63: mult \$s0, \$t1  mflo \$9 64: mflo \$t1  addi \$24,\$24,-1 65: addi \$t8, \$t8, -0x1 # contador  bne \$24,\$8,-4 66: bne \$t8, \$t0, LOOP_ELEVAR5  sub \$18,\$18,\$9 68: sub \$s2, \$s2, \$t1  addi \$18,\$18,1 69: addi \$s2, \$s2, 0x1  j 0x004000c0 70: j FIM  addi \$8,\$0,4097 74: addi \$t0, \$0, 0x1001  s11 \$8,\$8,16 75: s11 \$t0, \$t0, 16	addi \$24,\$0,3	60: addi \$t8, \$0, 0x3 # contador = expoente
mflo \$9 64: mflo \$tl addi \$24,\$24,-1 65: addi \$t8, \$t8, -0xl # contador bne \$24,\$8,-4 66: bne \$t8, \$t0, LOOP_ELEVAR5 sub \$18,\$18,\$9 68: sub \$s2, \$s2, \$tl addi \$18,\$18,1 69: addi \$s2, \$s2, 0xl j 0x004000c0 70: j FIM addi \$8,\$0,4097 74: addi \$t0, \$0, 0x1001 sll \$8,\$8,16 75: sll \$t0, \$t0, 16	addi \$9,\$16,0	61: addi \$t1, \$s0, 0x0
addi \$24,\$24,-1 65: addi \$t8, \$t8, -0xl # contador bne \$24,\$8,-4 66: bne \$t8, \$t0, LOOP_ELEVAR5 sub \$18,\$18,\$9 68: sub \$s2, \$s2, \$t1 addi \$18,\$18,1 69: addi \$s2, \$s2, 0xl j 0x004000c0 70: j FIM addi \$8,\$0,4097 74: addi \$t0, \$0, 0x1001 sll \$8,\$8,16 75: sll \$t0, \$t0, 16	mult \$16,\$9	63: mult \$s0, \$t1
bne \$24,\$8,-4 66: bne \$t8, \$t0, LOOP_ELEVAR5 sub \$18,\$18,\$9 68: sub \$s2, \$s2, \$t1 addi \$18,\$18,1 69: addi \$s2, \$s2, 0x1 j 0x004000c0 70: j FIM addi \$8,\$0,4097 74: addi \$t0, \$0, 0x1001 s11 \$8,\$8,16 75: s11 \$t0, \$t0, 16	mflo \$9	64: mflo \$tl
bne \$24,\$8,-4 66: bne \$t8, \$t0, LOOP_ELEVAR5  sub \$18,\$18,\$9 68: sub \$s2, \$s2, \$t1  addi \$18,\$18,1 69: addi \$s2, \$s2, 0x1  j 0x004000c0 70: j FIM  addi \$8,\$0,4097 74: addi \$t0, \$0, 0x1001  s11 \$8,\$8,16 75: s11 \$t0, \$t0, 16	addi \$24,\$24,-1	65: addi \$t8, \$t8, -0xl # contador
addi \$18,\$18,1 69: addi \$s2, \$s2, 0x1 j 0x004000c0 70: j FIM addi \$8,\$0,4097 74: addi \$t0, \$0, 0x1001 sll \$8,\$8,16 75: sll \$t0, \$t0, 16	bne \$24,\$8,-4	66: bne \$t8, \$t0, LOOP_ELEVAR5
addi \$18,\$18,1 69: addi \$s2, \$s2, 0x1 j 0x004000c0 70: j FIM addi \$8,\$0,4097 74: addi \$t0, \$0, 0x1001 sll \$8,\$8,16 75: sll \$t0, \$t0, 16	sub \$18,\$18,\$9	68: sub \$s2, \$s2, \$t1
addi \$8,\$0,4097 74: addi \$t0, \$0, 0x1001 sll \$8,\$8,16 75: sll \$t0, \$t0, 16	addi \$18,\$18,1	
sl1 \$8,\$8,16 75: sl1 \$t0, \$t0, 16	j 0x004000c0	70: j FIM
sl1 \$8,\$8,16 75: sl1 \$t0, \$t0, 16	addi \$8,\$0,4097	74: addi \$t0, \$0, 0x1001
		75: sll \$t0, \$t0, 16
	еы \$18 4/\$8)	76. sw 592 4/5t0)

Registers	Coproc 1	Coproc 0			
Name		Number		Value	
\$zero			0	0	
\$at			1	2	
\$v0			2	0	
\$vl			3	0	
\$a0			4	0	
\$al			5	0	
\$a2			6	0	
\$a3			7	0	
\$t0			8	268500992	
\$tl			9	27	
\$t2			10	0	
\$t3			11	0	
\$t4			12	0	
\$t5			13	0	
\$t6			14	0 0 3	
\$t7			15	0	
\$ <b>s</b> 0			16	3	
\$s1			17	0	
\$s2			18	217	
\$83			19	0	
\$84			20	0	
\$85			21	0	
\$86			22	0	
\$87			23	0	
\$t8			24	1	
\$t9			25	0	
\$k0			26	0	
\$kl			27	0	
\$gp			28	268468224	
\$sp		29		2147479548	
\$fp		30		0	
\$ra		31		0	
pc				4194508	
hi				0	
10				27	

Data Segment		
Address	Value (+0)	Value (+4)
0x10010000	3	217
0x10010020	0	0

```
.text
```

lui \$t0, 0x1001

```
lw $a0, 0 ($t0)
                            \# a0 => x
addi $sp,$sp -8
                            # adicionando na pilha
sw $t0, 8($sp)
                            # guardando $t0 na pilha
sw $a0, 4($sp)
                            # guardando $a0 na pilha
slt $t1, $0,$a0
                            \# Se 0 < x
beq $t1, $0 , Else
                            # nao => va para Else
jal MaiorZero
                            # chamando funcao Se x > 0
j Continua
Else:
                           # chamando funcao Se x <= 0</pre>
jal MenorIgualZero
Continua:
                            # reatribuindo o valor de t0
lw $t0, 8($sp)
lw $a0, 4($sp)
                            # reatribuindo o valor de a0
                            # voltar na pilha
addi $sp,$sp, 8
sw $v0, 4($t0)
                            # quardando o resultado na
segunda posicao
j Fim
\# a0 = valor
# a1 = expoente
Elevar:
    addi $sp,$sp,-8
                            # adicionando na pilha
   sw $s0, 8($sp)
                            # guardando $s0 na pilha
    sw $s1, 4($sp)
                            # quardando $s1 na pilha
```

```
add $s0, $a0, $0  # s0 = resultado + valor
   addi $s1, $a1, -1 # a1 = expoente -1
# a1 = numero de repeticoes
Loop:
   slt $t0, $0, $s1 # se 0 < a1
   beq $t0, $0, FimLoop # nao => va pra FimLoop
                     # repeticoes -1
   addi $s1, $s1, -1
   mult $s0, $a0
   mflo $s0
                       # volta ao loop
   j Loop
FimLoop:
                         # atribui o retorno
   add $v0,$s0,$0
   lw $s0, 8($sp) # reatribuindo o valor de s0
   lw $s1, 4($sp)
                         # reatribuindo o valor de s1
   addi $sp,$sp, 8
                         # voltar na pilha
   jr $ra
                         # retorna
\# a0 => x
MaiorZero:
   addi $sp,$sp,-8
                         # adicionando na pilha
   sw $ra, 8($sp)
                         # guardando $ra na pilha
   sw $a1, 4($sp)
                         # guardando $a1 na pilha =>
expoente
   addi $a1, $0,3 # a1 => 3
   #TODO CORPO
                         \# v0 \Rightarrow x^3
   jal Elevar
```

```
addi $v0,$v0,1
                  # v0 => x^3 + 1
                         # reatribuindo o valor de $ra
   lw $ra, 8($sp)
   lw $a1, 4($sp)
                        # reatribuindo o valor de $a1
   addi $sp,$sp, 8
                         # voltar na pilha
                      # retorna
   jr $ra
\# a0 => \times
MenorIgualZero:
   addi $sp,$sp,-8 # adicionando na pilha
   sw $ra, 8($sp)
                        # guardando $ra na pilha
   sw $a1, 4($sp)
                         # guardando $a1 na pilha =>
expoente
   addi $a1, $0,4 # a1 => 4
   #TODO CORPO
                        # v0 => x^4
   jal Elevar
                         # v0 => x^4 - 1
   addi $v0,$v0,-1
   lw $ra, 8($sp)
                         # reatribuindo o valor de $ra
   lw $a1, 4($sp)
                        # reatribuindo o valor de $a1
                         # voltar na pilha
   addi $sp,$sp, 8
                        # retorna
   jr $ra
Fim:
.data
x: .word 2
```

## y: .word -1

Basic		Source
lui \$8,4097	3: lui \$t0, 0x1001	
lw \$4,0(\$8)	5: lw \$a0, 0 (\$t0)	# a0 => x
addi \$29,\$29,-8	7: addi \$sp,\$sp -8	# adicionando na pilha
sw \$8,8(\$29)	8: sw \$t0, 8(\$sp)	# guardando \$t0 na pilha
sw \$4,4(\$29)	9: sw \$a0, 4(\$sp)	# guardando \$a0 na pilha
slt \$9,\$0,\$4	12: slt \$t1, \$0,\$a0	# Se 0 < x
beq \$9,\$0,2	13: beq \$t1, \$0 , Else	# nao => va para Else
jal 0x0040007c	14: jal MaiorZero	# chamando funcao Se x > 0
j 0x00400028	16: j Continua	
jal 0x004000a4	19: jal MenorIgualZero	# chamando funcao Se x <= 0
lw \$8,8(\$29)	23: lw \$t0, 8(\$sp)	# reatribuindo o valor de t0
lw \$4,4(\$29)	24: lw \$a0, 4(\$sp)	# reatribuindo o valor de a0
addi \$29,\$29,8	25: addi \$sp,\$sp, 8	# voltar na pilha
sw \$2,4(\$8)	27: sw \$v0, 4(\$t0)	# guardando o resultado na segunda posicao
j 0x004000cc	29: j Fim	
addi \$29,\$29,-8	34: addi \$sp,\$sp,-8	# adicionando na pilha
sw \$16,8(\$29)	35: sw \$s0, 8(\$sp)	# guardando \$s0 na pilha
sw \$17,4(\$29)	36: sw \$sl, 4(\$sp)	# guardando \$sl na pilha
add \$16,\$4,\$0	38: add \$s0, \$a0,\$0	# s0 = resultado + valor
addi \$17,\$5,-1	40: addi \$sl, \$al, -1	# al = expoente -l
slt \$8,\$0,\$17	43: slt \$t0, \$0, \$sl	# se 0 < al
beq \$8,\$0,4	44: beq \$t0, \$0, FimLoop	# nao => va pra FimLoop
addi \$17,\$17,-1	45: addi \$sl, \$sl, -1	# repeticoes -1
mult \$16,\$4	46: mult \$s0, \$a0	
mflo \$16	47: mflo \$s0	
j 0x00400050	48: j Loop	# volta ao loop
add \$2,\$16,\$0	51: add \$v0,\$s0,\$0	# atribui o retorno
lw \$16,8(\$29)	53: lw \$s0, 8(\$sp)	# reatribuindo o valor de s0
lw \$17,4(\$29)	54: lw \$sl, 4(\$sp)	# reatribuindo o valor de sl
addi \$29,\$29,8	55: addi \$sp,\$sp, 8	# voltar na pilha
jr \$31	57: jr \$ra	# retorna
addi \$29,\$29,-8	61: addi \$sp,\$sp,-8	# adicionando na pilha
sw \$31,8(\$29)	62: sw \$ra, 8(\$sp)	# guardando \$ra na pilha
sw \$5,4(\$29)	63: sw \$al, 4(\$sp)	# guardando \$al na pilha => expoente
addi \$5,\$0,3	65: addi \$al, \$0,3	# al => 3
jal 0x0040003c	68: jal Elevar	# v0 => x^3
addi \$2,\$2,1	70: addi \$v0,\$v0,1	# v0 => x^3 + 1
lw \$31,8(\$29)	72: lw \$ra, 8(\$sp)	# reatribuindo o valor de \$ra
lw \$5,4(\$29)	73: lw \$al, 4(\$sp)	# reatribuindo o valor de \$al
addi \$29,\$29,8	74: addi \$sp,\$sp, 8	# voltar na pilha
jr \$31	76: jr \$ra	# retorna
addi \$29,\$29,-8	80: addi \$sp,\$sp,-8	# adicionando na pilha
sw \$31,8(\$29)	81: sw \$ra, 8(\$sp)	# guardando \$ra na pilha
sw \$5,4(\$29)	82: sw \$al, 4(\$sp)	# guardando \$al na pilha => expoente
addi \$5,\$0,4	84: addi \$al, \$0,4	# al => 4
jal 0x0040003c	87: jal Elevar	# v0 => x^4
addi \$2,\$2,-1	89: addi \$v0,\$v0,-1	# v0 => x^4 - 1
lw \$31,8(\$29)	91: lw \$ra, 8(\$sp)	# reatribuindo o valor de \$ra
lw \$5,4(\$29)	92: lw \$al, 4(\$sp)	# reatribuindo o valor de \$al
addi \$29,\$29,8	93: addi \$sp,\$sp, 8	# voltar na pilha
jr \$31	95: jr \$ra	# retorna

Registers	Coproc 1	Coproc 0				
Na	Name		Name Number		Value	
\$zero			0	0		
\$at			1	0		
\$v0			2	9		
\$v1			3	0		
\$a0			4	2		
\$al			5	0		
\$a2			6	0		
\$a3			7	0		
\$t0			8	268500992		
\$t1			9	1		
\$t2			10	0		
\$t3			11	0		
\$t4			12	0		
\$t5			13	0		
\$t6			14	0		
\$t7			15	0		
\$80			16	0		
\$s1			17	0		
\$s2			18	0		
\$83			19	0		
\$84			20	0		
\$85			21	0		
\$86			22	0		
\$87			23	0		
\$t8			24	0		
\$t9			25	0		
\$k0			26	0		
\$kl			27	0		
\$gp			28	268468224		
\$sp			29	2147479548		
\$fp		30		0		
\$ra		31		4194336		
pc				4194508		
hi				0		
10				8		

Data Segment					
Address	Value (+0)	Value (+4)	Value (+8)		
0x10010000	2	9	0		
0x10010020	0	0	0		

.text

```
lui $t0, 0x1001
```

```
lw $a0, 0 ($t0)
                           \# a0 => x
lw $a1, 4 ($t0)
                          # a1 => y
lw $a2, 8 ($t0)
                          # a2 => z
mult $a0, $a1
                          # lo <-- x * y
mfhi $t1
                           # t1 => x * y > 32bits
                           # t2 => x * y < 32bits
mflo $t2
sll $t1, $t1, 24
                          # t1 => 0x 1d00 0000
srl $t2, $t2, 8
                          # t2 => 0x 00cd 6500
add $t1,$t1,$t2
                          # t1 => 0x 1dcd 6500
div $t1, $a2
mfhi $t1
                          # t1 => 0x 0000 0000
                           # t2 => 0x 0000 04e2
mflo $t2
sll $t2, $t2, 8
                          # t2 => 0x 0004 e200
sw $t2, 12 ($t0)
                          # resultado => t2
.data
x: .word 0x186A00
y: .word 0x13880
z: .word 0x61A80
resultado: .word -1
```

Basic		Source
lui \$8,4097	3: lui \$t0, 0x1001	
lw \$4,0(\$8)	5: lw \$a0, 0 (\$t0)	# a0 => x
lw \$5,4(\$8)	6: lw \$a1, 4 (\$t0)	# al => y
lw \$6,8(\$8)	7: lw \$a2, 8 (\$t0)	# a2 => z
mult \$4,\$5	9: mult \$a0, \$al	# 10 < x * y
mfhi \$9	10: mfhi \$tl	# tl => x * y > 32bits
mflo \$10	11: mflo \$t2	# t2 => x * y < 32bits
sll \$9,\$9,24	13: sll \$tl, \$tl, 24	# tl => 0x 1d00 0000
srl \$10,\$10,8	14: srl \$t2, \$t2, 8	# t2 => 0x 00cd 6500
add \$9,\$9,\$10	16: add \$t1,\$t1,\$t2	# tl => 0x ldcd 6500
div \$9,\$6	18: div \$t1, \$a2	
mfhi \$9	20: mfhi \$tl	# tl => 0x 0000 0000
mflo \$10	21: mflo \$t2	# t2 => 0x 0000 04e2
sll \$10,\$10,8	23: sl1 \$t2, \$t2, 8	# t2 => 0x 0004 e200
sw \$10,12(\$8)	25: sw \$t2, 12 (\$t0)	# resultado => t2

Registers	Coproc 1	Coproc 0		
Na	ame	N	lumber	Value
\$zero			0	0
\$at			1	0
\$v0			2	0
\$v1			3	0
\$a0			4	1600000
\$al			5	80000
\$a2			6	400000
\$a3			7	0
\$t0			8	268500992
\$t1			9	0
\$t2			10	320000
\$t3			11	0
\$t4			12	0
\$t5			13	0
\$t6			14	0
\$t7			15	0
\$80			16	0
\$s1			17	0
\$s2			18	0
\$83			19	0
\$84			20	0
\$85			21	0
\$86			22	0
\$87			23	0
\$t8			24	0
\$t9			25	0
\$k0			26	0
\$kl			27	0
\$gp			28	268468224
\$sp			29	2147479548
\$fp			30	0
\$ra			31	0
pc				4194364
hi				0
10				1250

Data Segment						
Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	
0x10010000	1600000	80000	400000	320000	0	
0x10010020	0	0	0	0	0	

Basic		Source
lui \$8,4097	3: lui \$t0, 0x1001	
lw \$4,0(\$8)	5: lw \$a0, 0 (\$t0)	# a0 => x
lw \$5,4(\$8)	6: lw \$al, 4 (\$t0)	# al => y
mult \$4,\$5	8: mult \$a0, \$al	# 1o < x * y
mflo \$9	9: mflo \$tl	# tl => x * y < 32bits
sw \$9,8(\$8)	11: sw \$t1, 8 (\$t0)	<pre># resultado =&gt; t2</pre>

Registers Coproc 1	Coproc 0	
Name	Number	Value
\$zero	C	0
\$at	1	
\$v0	2	. 0
\$vl	3	
\$a0	4	
\$al	5	2
\$a2	6	
\$a3	7	
\$t0	8	
\$t1	g	
\$t2	10	
\$t3	11	
\$t4	12	
\$t5	13	
\$t6	14	
\$t7	15	
\$80	16	
\$s1	17	
\$s2	18	0
\$83	19	
\$s4	20	0
\$85	21	
\$36	22	. 0
\$87	23	
\$t8	24	0
\$t9	25	0
\$k0	26	0
\$kl	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	. 0
pc		4194328
hi		0
10		20

☐ Data Segment					
Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	
0x10010000	10	2	20	0	
0x10010020	0	0	0	0	

```
.text
lui $t0, 0x1001
lw $a0, 0 ($t0) # a0 => x
```

```
lw $a1, 4 ($t0)
                           # a1 => y
addi $sp,$sp -12
                           # adicionando na pilha
sw $t0, 12($sp)
                           # guardando $t0 na pilha
sw $a0, 8($sp)
                           # guardando $a0 na pilha
sw $a1, 4($sp)
                           # guardando $a1 na pilha
jal Elevar
                          # chamando funcao Loop
#TODO carregar o antigo $t0
lw $t0, 12($sp)
                           # reatribuindo o valor de t0
                          # reatribuindo o valor de a0
lw $a0, 8($sp)
lw $a1, 4($sp)
                          # reatribuindo o valor de a1
                          # voltar na pilha
addi $sp,$sp, 12
sw $v0, 8($t0)
j FimElevar
\# a0 = valor
# a1 = expoente
Elevar:
   addi $sp,$sp,-8 # adicionando na pilha
   sw $s0, 8($sp)
                          # quardando $s0 na pilha
   sw $s1, 4($sp)
                           # guardando $s1 na pilha
   add $s0, $a0,$0
                          # s0 = resultado + valor
   addi $s1, $a1, -1 # a1 = expoente -1
# a1 = numero de repeticoes
Loop:
   slt $t0, $0, $s1
                      # se 0 < a1
```

```
beq $t0, $0, FimLoop # nao => va pra FimLoop
   addi $s1, $s1, -1 # repeticoes -1
   mult $s0, $a0
   mflo $s0
                          # volta ao loop
   j Loop
FimLoop:
   add $v0,$s0,$0 # atribui o retorno
   lw $s0, 8($sp)
                          # reatribuindo o valor de s0
                          # reatribuindo o valor de s1
   lw $s1, 4($sp)
   addi $sp,$sp, 8
                          # voltar na pilha
   jr $ra
                         # retorna
FimElevar:
.data
x: .word 2
y: .word 3
k: .word 0
```

Basic		Source	
lui \$8,4097	3: lui \$t0, 0x1001	Course	
lw \$4,0(\$8)	5: lw \$a0, 0 (\$t0)	# a0 => x	
lw \$5,4(\$8)	6: lw \$al, 4 (\$t0)	# al => v	
addi \$29,\$29,-12	8: addi \$sp,\$sp -12	# adicionando na pilha	
sw \$8,12(\$29)	9: sw \$t0, 12(\$sp)	# guardando \$t0 na pilha	
sw \$4,8(\$29)	10: sw \$a0, 8(\$sp)	# quardando \$40 na pilha	
sw \$5,4(\$29)	11: sw \$a1, 4(\$sp)	# quardando \$al na pilha	
ial 0x00400038	13: jal Elevar	# chamando funcao Loop	
lw \$8,12(\$29)	16: lw \$t0, 12(\$sp)	# reatribuindo o valor de t0	
lw \$4,8(\$29)	17: lw \$a0, 8(\$sp)	# reatribuindo o valor de a0	
lw \$5,4(\$29)	18: lw \$al, 4(\$sp)	# reatribuindo o valor de al	
addi \$29,\$29,12	19: addi \$sp,\$sp, 12	# voltar na pilha	
sw \$2,8(\$8)	22: sw \$v0, 8(\$t0)	y vorour na prina	
i 0x00400078	24: j FimElevar		
addi \$29,\$29,-8	29: addi \$sp,\$sp,-8	# adicionando na pilha	
sw \$16,8(\$29)	30: sw \$s0, 8(\$sp)	# quardando \$s0 na pilha	
sw \$17,4(\$29)	31: sw \$sl, 4(\$sp)	# quardando \$sl na pilha	
add \$16,\$4,\$0	33: add \$s0, \$a0,\$0	# s0 = resultado + valor	
addi \$17,\$5,-1	35: addi \$sl, \$al, -1	# al = expoente -1	
slt \$8,\$0,\$17		# se 0 < al	
beg \$8,\$0,4		# nao => va pra FimLoop	
addi \$17,\$17,-1	40: addi \$sl, \$sl, -1	# repeticoes -1	
mult \$16,\$4	41: mult \$s0, \$a0		
mflo \$16	42: mflo \$s0		
i 0x0040004c	43: j Loop	# volta ao loop	
add \$2,\$16,\$0	45: add \$v0,\$s0,\$0	# atribui o retorno	
lw \$16,8(\$29)	47: lw \$s0, 8(\$sp)	# reatribuindo o valor de s0	
lw \$17,4(\$29)	48: lw \$sl, 4(\$sp)	# reatribuindo o valor de sl	
addi \$29,\$29,8	49: addi \$sp,\$sp, 8	# voltar na pilha	
jr \$31	51: jr \$ra	# retorna	

Registers	Coproc 1	Coproc 0			
Name		Number		Value	
\$zero		0		0	
\$at			1	0	
\$v0		2		8	
\$vl			3	0	
\$a0			4		
\$al			5	3	
\$a2			6	0	
\$a3			7	0	
\$t0			8		
\$t1			9		
\$t2			10		
\$t3			11		
\$t4			12	0	
\$t5			13	0	
\$t6			14	0	
\$t7			15		
\$80			16		
\$sl			17		
\$s2			18		
\$83			19	0	
\$84			20	0	
\$85			21	0	
\$86			22		
\$87			23		
\$t8			24	0	
\$t9			25		
\$k0			26		
\$kl		27			
\$gp			28	268468224	
\$sp			29		
\$fp			30	0	
şra		31		4194336	
pc				4194424	
hi					
10				0	

Data Segment							
Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)			
0x10010000	2	3	8	0			
0x10010020	0	0	0	0			