

HP-41C Jacobi Diagonalization by Milt Johnston
PPC Calculator Journal Vol 9 No 3 P10 Apr 1982

```
01 LBL 86      ;Calculate U Matrix (Transformation)
02 SF 03
03 RCL 00
04 XEQ 84
05 STO 04
06 LBL 12
07 RCL 04
08 INT
09 RCL 09
10 XEQ 89
11 STO 07
12 RCL 04
13 INT
14 RCL 10
15 XEQ 89
16 STO 08
17 XEQ 90
18 ISG 04
19 GTO 12
20 CF 03
21 RTN
22 LBL 89
23 RCL 16
24 +
25 X<>Y
26 1
27 -
28 RCL 00
29 *
30 +
31 RTN
32 LBL 91      ;Print the Final U Matrix
33 SF 12
34 ADV
35 ADV
36 ADV
37 "EIGENVECTORS"
38 XROM 29,08 ;PRA
39 ADV
40 CF 12
41 RCL 00
42 XEQ 84
43 STO 04
44 STO 05
45 STO 06
46 LBL 05
47 SF 04
48 RCL 04
49 STO 06
50 LBL 06
51 FS? 04
52 ADV
53 RCL 06
54 INT
55 RCL 05
56 INT
57 SF 05
58 XEQ 98
59 XEQ 89
60 RCL IND X
61 XROM 29,01 ;ACA
62 FIX 9
63 XROM 29,05 ;ACX
64 XROM 29,10 ;PRBUF
65 ISG 06
66 GTO 06
67 ISG 05
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68 GTO 05
69 ADV
70 ADV
71 RTN
72 LBL 94      ;Set U Equal to the Unit Matrix
73 RCL 16
74 RCL 00
75 X^2
76 +
77 XEQ 84
78 RCL 16
79 +
80 ENTER
81 ENTER
82 .
83 LBL 07
84 STO IND Y
85 ISG Y
86 GTO 07
87 RCL Z
88 RCL 00
89 1
90 +
91 E5
92 /
93 +
94 1
95 LBL 08
96 STO IND Y
97 ISG Y
98 GTO 08
99 RTN
100 LBL 88     ;Prompt for Eigenvectors
101 ADV
102 CF 02
103 "EIGEN"
104 XROM 29,01 ;ACA
105 "VECTORS"
106 XROM 29,01 ;ACA
107 ">?"      ;Append 1 question mark
108 AON
109 BEEP
110 PROMPT
111 ASTO Y
112 "Y"
113 ASTO X
114 AOFF
115 X=Y?
116 SF 02
117 FS? 02
118 " IN"
119 FC? 02
120 " EX"
121 ">CLUDED"
122 XROM 29,01 ;ACA
123 XROM 29,10 ;PRBUF
124 ADV
125 RTN
126 LBL "SS"   ;Enter Largest Value for Off-Diagonal Element
127 "MAX OFF-DIAG"
128 ">" = "    ;Append space, equal sign, space
129 SCI 03
130 ABS
131 STO 03
132 XEQ 99
133 ADV
134 RTN
135 LBL "OR"   ;Enter Order of Matrix N
136 FIX 0
137 "N ="

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138 XEQ 99
139 ADV
140 STO 00
141 RCL X
142 1
143 +
144 *
145 2
146 /
147 STO 01
148 16
149 +
150 STO 16
151 E3
152 /
153 STO 02
154 17
155 ST+ 02
156 RTN
157 LBL 99      ;Utility Print Routine
158 XROM 29,01 ;ACA
159 XROM 29,05 ;ACX
160 XROM 29,10 ;PRBUF
161 RTN
162 LBL "DA"    ;Display the A Matrix
163 SF 04
164 GTO 11
165 LBL "RJ"    ;Read the A Matrix
166 CF 04
167 LBL 11
168 RCL 02
169 STO 04
170 LBL 01
171 RCL 04
172 INT
173 XEQ 92
174 X=Y?
175 ADV
176 XEQ 98
177 FS? 04
178 GTO 00
179 TONE 9
180 PROMPT
181 STO IND 04
182 GTO 09
183 LBL 00
184 RCL IND 04
185 LBL 09
186 FIX 9
187 XEQ 99
188 ISG 04
189 GTO 01
190 GTO 10
191 LBL 93      ;Find Largest Off-Diagonal Element
192 RCL 02
193 STO 04
194 .
195 STO 05
196 18
197 STO 06
198 LBL 02
199 RCL 05
200 RCL IND 04
201 ABS
202 X<=Y?
203 GTO 00
204 STO 09
205 RCL 04
206 INT
207 XEQ 92

```

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208 X=Y?
209 GTO 00
210 RCL 09
211 STO 05
212 RCL 04
213 STO 06
214 LBL 00
215 ISG 04
216 GTO 02
217 RCL 06
218 INT
219 STO 06
220 RCL 05
221 RCL 03
222 X>Y?
223 SF 01
224 RCL IND 06
225 STO 05
226 RTN
227 LBL "RE" ;Resume Calculation with New Convergence Value
228 XEQ "SS" ;Enter Largest Off-Diagonal Value (Line 126)
229 SF 06
230 LBL "EI" ;Calculate Eigenvalues (and Eigenvectors)
231 FC? 06
232 XEQ 88
233 ADV
234 SF 12
235 "ITERATIONS"
236 XROM 29,08 ;PRA
237 ADV
238 ADV
239 CF 12
240 CF 01
241 FS?C 06
242 GTO 97
243 FS? 02
244 XEQ 94
245 LBL 97 ;Print the Largest Off-Diagonal Element,
246 FS? 55 ;Check for Convergence, then Continue or Exit
247 XEQ 85
248 XEQ 93
249 RCL 06
250 XEQ 92
251 STO 10
252 X<>Y
253 STO 09
254 X<>Y
255 FC? 55
256 XEQ 85
257 XEQ 98
258 RCL 05
259 FIX 9
260 XEQ 99
261 FS? 01
262 GTO 95
263 FS? 55
264 XEQ 85
265 RCL 09
266 ENTER
267 XEQ 87
268 RCL IND X
269 STO 14
270 RCL 10
271 ENTER
272 XEQ 87
273 RCL IND X
274 STO 15
275 RCL 14
276 SF 00
277 X>Y?

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```
278 CF 00
279 -
280 X^2
281 RCL 05
282 X^2
283 4
284 *
285 +
286 SQRT
287 STO 13
288 RCL 14
289 RCL 15
290 -
291 X<>Y
292 /
293 FS? 00
294 CHS
295 1
296 +
297 2
298 /
299 SQRT
300 FS? 00
301 STO 12
302 FC? 00
303 STO 11
304 RCL 05
305 ABS
306 RCL 13
307 /
308 FS? 00
309 RCL 12
310 FC? 00
311 RCL 11
312 /
313 FS? 00
314 STO 11
315 FC? 00
316 STO 12
317 RCL 05
318 SIGN
319 ST* 11
320 RCL 13
321 RCL 14
322 RCL 15
323 +
324 +
325 2
326 /
327 STO 14
328 RCL 13
329 -
330 STO 15
331 RCL 09
332 ENTER
333 XEQ 87
334 RCL 14
335 STO IND Y
336 RCL 10
337 ENTER
338 XEQ 87
339 RCL 15
340 STO IND Y
341 RCL 09
342 RCL 10
343 XEQ 87
344 .
345 STO IND Y
346 RCL 00
347 XEQ 84
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348 STO 13
349 LBL 96
350 RCL 13
351 INT
352 RCL 09
353 X=Y?
354 GTO 00
355 X<=Y?
356 X<>Y
357 XEQ 87
358 STO 07
359 RCL 13
360 INT
361 RCL 10
362 X=Y?
363 GTO 08
364 X<=Y?
365 X<>Y
366 XEQ 87
367 STO 08
368 LBL 90
369 RCL IND 07
370 RCL 11
371 *
372 RCL IND 08
373 RCL 12
374 *
375 +
376 RCL IND 08
377 RCL 11
378 *
379 RCL IND 07
380 RCL 12
381 *
382 -
383 STO IND 08
384 X<>Y
385 STO IND 07
386 FS? 03
387 RTN
388 LBL 00
389 ISG 13
390 GTO 96
391 FS? 02
392 XEQ 86
393 GTO 97
394 LBL 95      ;Print Eigenvalues (and Eigenvectors)
395 FC? 55
396 XEQ 85
397 RCL 00
398 XEQ 84
399 STO 04
400 ADV
401 ADV
402 "EIGENVALUES"
403 SF 12
404 XROM 29,08 ;PRA
405 CF 12
406 ADV
407 ADV
408 LBL 03
409 RCL 04
410 INT
411 ENTER
412 XEQ 87
413 RCL IND X
414 "\0B\28"   ;Lambda, left parenthesis
415 FIX 0
416 ARCL 04
417 ">\29"     ;Append right parenthesis

```

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418 >" = "      ;Append space, equal sign, space
419 FIX 9
420 XEQ 99
421 ISG 04
422 GTO 03
423 FS? 02
424 XEQ 91
425 RTN
426 LBL 87      ;Calculate Element Address in A
427 X<>Y
428 STO Z
429 -
430 16
431 +
432 RCL Y
433 1
434 -
435 RCL 00
436 *
437 +
438 X<>Y
439 3
440 -
441 R^
442 *
443 2
444 /
445 -
446 RTN
447 LBL 92      ;Get I and J from Register Address
448 16
449 -
450 RCL 01
451 X#Y?
452 GTO 00
453 RCL 00
454 RCL 00
455 RTN
456 LBL 00
457 STO 07
458 2
459 STO 08
460 RCL Z
461 LBL 14
462 RCL 07
463 X<=Y?
464 GTO 13
465 RCL 08
466 ST- 07
467 1
468 ST+ 08
469 R^
470 GTO 14
471 LBL 13
472 -
473 RCL 00
474 RCL 08
475 -
476 2
477 +
478 STO Z
479 +
480 RTN
481 LBL "AE"    ;Alter an Incorrectly Entered Value
482 ADV
483 SF 12
484 "CHANGES"
485 ADV
486 XROM 29,08 ;PRA
487 CF 12

```

```

488 ADV
489 LBL 04
490 "(I,J)?"
491 TONE 0
492 PROMPT
493 FC?C 22
494 GTO 10
495 X<=Y?
496 X<>Y
497 XEQ 98
498 XROM 29,01 ;ACA
499 XEQ 87
500 ">?" ;Append 1 question mark
501 TONE 7
502 PROMPT
503 STO IND Y
504 FIX 9
505 XROM 29,05 ;ACX
506 XROM 29,10 ;PRBUF
507 CF 22
508 GTO 04
509 LBL 10
510 CF 04
511 ADV
512 ADV
513 ADV
514 BEEP
515 RTN
516 LBL 85 ;Invert Printing Flag
517 55
518 XROM 10,49 ;IF - Invert Flag (from PPC ROM)
519 RTN
520 LBL 98 ;Print Doubly-Subscripted Variables
521 "A"
522 FS?C 05
523 "U"
524 ">\28" ;Append left parenthesis
525 FIX 0
526 ARCL Y
527 ">," ;Append 1 comma
528 ARCL X
529 ">\29 = " ;Append right parenthesis, space, equal sign, space
530 RTN
531 LBL 84 ;Utility Arithmetic Routine
532 E3
533 /
534 1
535 +
536 RTN
537 LBL "SA" ;Save Original RSM before Diagonalization
538 RCL 02
539 FRC
540 XROM 30,08 ;WDTAX
541 END

```


03C0CF56A80320E00054340D246829E000593724682AE00059
38E0005A9604BD00A90385CF5990104071114120424085CF5B
A80C8F8F8FFC454947454E564543544F5253A7488FA90C20E0
005434353606A804243607AC048F26682568A805E00062E000
5990F3A7419C09A745A74A9606B7009605B6008F8F85CF5E90
10205140E0005490104083831A0891F29672B8009071201140
1B154340110991F29672B90085CF588FA902F5454947454EA7
41F7564543544F5253A741F27F3F8C868E9A72F1599A738B78
A802AC02F320494EAD02F3204558F77F434C55444544A741A7
4A8F85C000F3005353FC4D4158204F46462D44494147F47F20
3D209D036133E000638F85C000F3004F529C00F34E203DE000
638F30907311404212433111164091101B1343321117920285
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246883E0005790F3F20B289C009B04F27F29F47F203D209C09
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0137123890710F2746BE0028930711920874BF000E41202841
124091714085C000F30041458FA80CF74348414E4745538FA7
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41E00057F27F3F9F078E91F29C09A745A74AA916B5000BA904
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960 BYTES

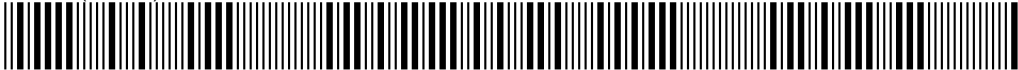
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Program Registers Needed: 138

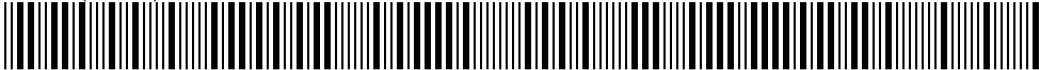
Row 1 (1 - 9)



Row 2 (10 - 17)



Row 3 (17 - 24)



Row 4 (25 - 35)



Row 5 (36 - 37)



Row 6 (37 - 45)



Row 7 (46 - 56)



Row 8 (57 - 62)



Row 9 (62 - 68)



Row 10 (69 - 77)



Row 11 (78 - 86)



Row 12 (87 - 96)



Row 13 (97 - 103)



Row 14 (103 - 105)



Row 15 (106 - 113)

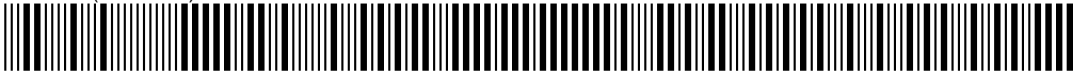


Row 16 (113 - 119)



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Row 17 (120 - 122)



Row 18 (122 - 127)



Row 19 (127 - 128)



Row 20 (128 - 135)



Row 21 (135 - 138)



Row 22 (138 - 148)



Row 23 (149 - 157)



Row 24 (157 - 162)



Row 25 (162 - 166)



Row 26 (167 - 176)



Row 27 (176 - 183)



Row 28 (184 - 190)



Row 29 (190 - 200)



Row 30 (200 - 209)



Row 31 (209 - 219)



Row 32 (220 - 227)



Row 33 (227 - 230)



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Row 34 (230 - 235)



Row 35 (235 - 239)



Row 36 (240 - 245)



Row 37 (245 - 250)



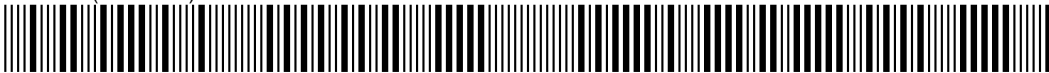
Row 38 (251 - 258)



Row 39 (259 - 264)



Row 40 (264 - 272)



Row 41 (272 - 280)



Row 42 (281 - 293)



Row 43 (293 - 303)



Row 44 (304 - 313)



Row 45 (314 - 324)



Row 46 (325 - 335)



Row 47 (335 - 343)



Row 48 (343 - 351)



Row 49 (352 - 361)



Row 50 (362 - 369)



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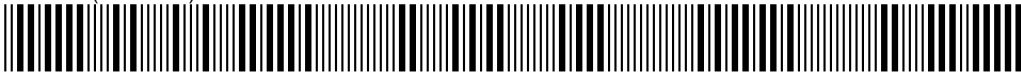
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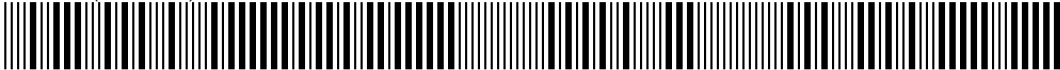
Row 52 (380 - 389)



Row 53 (389 - 394)



Row 54 (394 - 401)



Row 55 (402 - 403)



Row 56 (403 - 412)



Row 57 (412 - 417)



Row 58 (418 - 422)



Row 59 (422 - 429)



Row 60 (430 - 440)



Row 61 (441 - 451)



Row 62 (452 - 462)



Row 63 (463 - 471)



Row 64 (472 - 481)



Row 65 (481 - 484)



Row 66 (484 - 490)



Row 67 (490 - 497)



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Row 68 (497 - 503)



Row 69 (503 - 510)



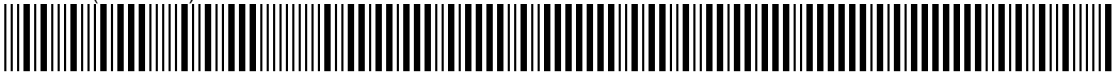
Row 70 (510 - 518)



Row 71 (518 - 524)



Row 72 (525 - 529)



Row 73 (529 - 537)



Row 74 (537 - 541)

