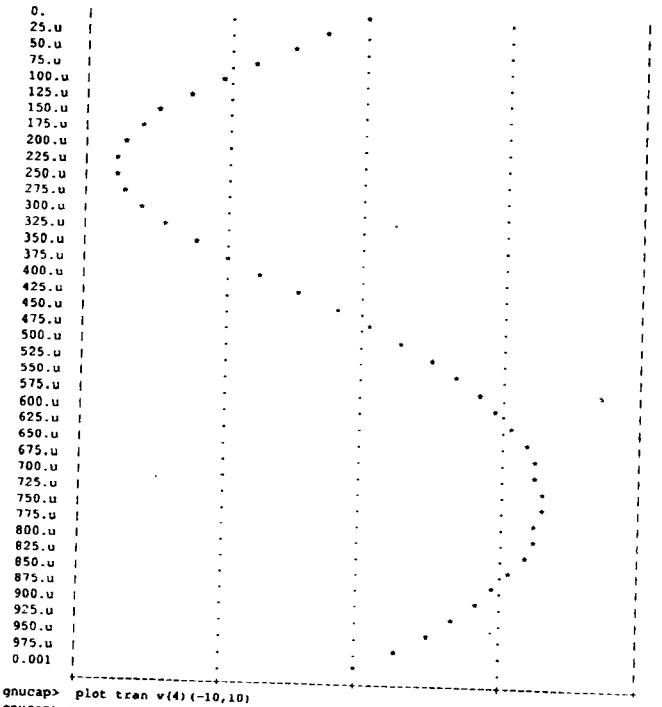
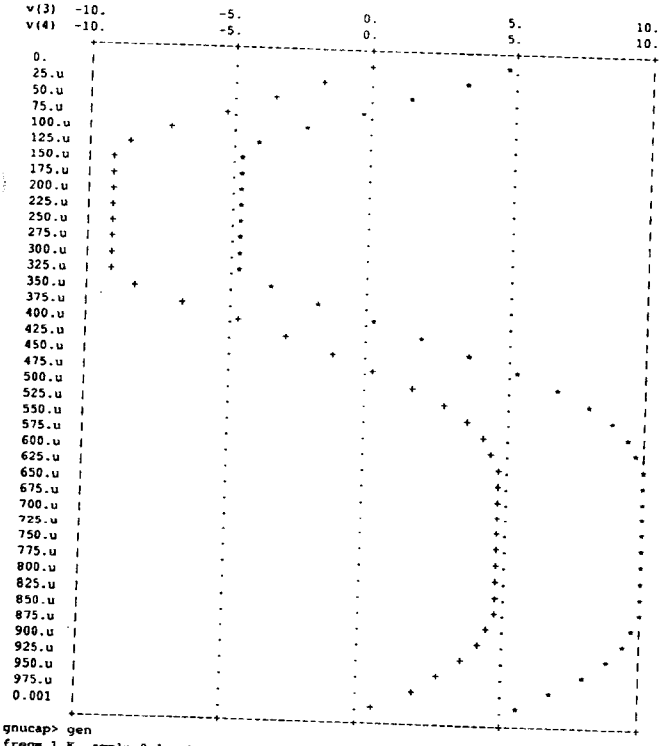
```
gnucap> b
>m1 3 1 2 6 nnn w=500u l=10u
>m2 5 3 4 6 nnn w=20000u l=10u
>rs 5 3 1meg
>rd 2 6 1.08meg
>rout 4 6 2k
>cs 2 6 .16u
>vdd 5 0 dc 10
>vss 6 0 dc -10
>
gnucap> l
M1  3  1  2  6  nnn  l= 10.u  w= 500.u  nrd= 1.  nrs= 1.
M2  5  3  4  6  nnn  l= 10.u  w= 0.02  nrd= 1.  nrs= 1.
Rs  5  3  1.Meg
Rd  2  6  1.08Meg
Rout  4  6  2.K
Cs  2  6  160.n
Vdd  5  0  DC  10.
Vss  6  0  DC  -10.

gnucap> b
>.model nnn nmos kp=20u vto=4.5
>
gnucap> l
M1  3  1  2  6  nnn  l= 10.u  w= 500.u  nrd= 1.  nrs= 1.
M2  5  3  4  6  nnn  l= 10.u  w= 0.02  nrd= 1.  nrs= 1.
Rs  5  3  1.Meg
Rd  2  6  1.08Meg
Rout  4  6  2.K
Cs  2  6  160.n
Vdd  5  0  DC  10.
Vss  6  0  DC  -10.
.model  nnn  nmos  (level=1  tnom= 27.  fc= 0.5  pb= 0.8  cj= 0.
+  mj= 0.5  cjsw= 0.  mjsw= 0.5  is= 10.f  rsh= 0.  cgso= 0.  cgdo= 0.
+  cgbo= 0.  vto= 4.5  gamma= 0.  phi= 0.6  ld= 0.  uo= 600.  tpg=1
+  kp= 20.u)
*+(* cox= 0.)
gnucap> save test.ckt
test.ckt exists.  replace? y
gnucap> pr op v nodes
gnucap> op
#           v(1)        v(2)        v(3)        v(4)        v(5)        v(6)
 300.15     0.         -4.6         5.         -27.965u     10.        -10.
gnucap> b
>rg 1 0 1meg
>
gnucap> op
#           v(1)        v(2)        v(3)        v(4)        v(5)        v(6)
 300.15     0.         -4.6         5.         -27.965u     10.        -10.
gnucap> b
>vin 1 0 ac 1
>
gnucap> pr ac v nodes
gnucap> ac 1k
#Freq        v(1)        v(2)        v(3)        v(4)        v(5)        v(6)
 1.K         1.          0.          0.          0.          0.          0.
gnucap> op
#           v(1)        v(2)        v(3)        v(4)        v(5)        v(6)
 300.15     0.         -4.6         5.         -27.965u     10.        -10.
gnucap> ac
#Freq        v(1)        v(2)        v(3)        v(4)        v(5)        v(6)
 1.K         1.          0.098974    99.5        97.073      484.37n     484.37n
gnucap> pr ac vdb nodes
gnucap> ac
#Freq        vdb(1)      vdb(2)      vdb(3)      vdb(4)      vdb(5)      vdb(6)
 1.K        -86.858p    -20.09       39.956      39.742     -126.3      -126.3
gnucap> ac 100
#Freq        vdb(1)      vdb(2)      vdb(3)      vdb(4)      vdb(5)      vdb(6)
 100.       -86.858p    -3.0734      36.973      36.759     -129.28     -129.28

gnucap> b
>vin 1 0 gen
>
gnucap> ac 1k
#Freq        vdb(1)      vdb(2)      vdb(3)      vdb(4)      vdb(5)      vdb(6)
 1.K         0.         -1.K        -1.K        -1.K        -1.K        -1.K
gnucap> op
#           v(1)        v(2)        v(3)        v(4)        v(5)        v(6)
 300.15     0.         -4.6         5.         -27.965u     10.        -10.
gnucap> ac1k
#Freq        vdb(1)      vdb(2)      vdb(3)      vdb(4)      vdb(5)      vdb(6)
 1.K         0.         -20.09       39.956      39.742     -126.3      -126.3
gnucap> gen
freq= 0.  ampl= 1.  phase= 0.  max= 1.  min= 0.  offset= 0.  init= 0.
+  rise= 1.p  fall= 1.p  delay= 0.  width= 0.  period= 0.
gnucap> gen freq=1k ampl=.01
gnucap> gnucap> pr tran v nodes
gnucap> gnucap> tran 0 .001 .0001
#Time        v(1)        v(2)        v(3)        v(4)        v(5)        v(6)
 0.          0.         -4.6         5.         -27.965u     10.        -10.
 100.u       0.0058779  -4.5998      4.4149     -0.57064     10.        -10.
 200.u       0.0095106  -4.5993      4.0772     -0.89975     10.        -10.
 300.u       0.0095106  -4.5988      4.1377     -0.8408      10.        -10.
 400.u       0.0058779  -4.5984      4.5667     -0.42265     10.        -10.
 500.u       0.         -4.5983      5.1701      0.16598     10.        -10.
 600.u      -0.0058779  -4.5986      5.7051      0.68822     10.        -10.
 700.u      -0.0095106  -4.5991      5.9879      0.96435     10.        -10.
 800.u      -0.0095106  -4.5997      5.9339      0.9116      10.        -10.
 900.u      -0.0058779  -4.6002      5.5559      0.54253     10.        -10.
 0.001       0.         -4.6003      4.9681     -0.03113     10.        -10.
gnucap> plot tran v(4)(-1,1)
gnucap> tran 0 .001 .000025
v(4)  -1.                -0.5                0.                 0.5                 1.
      +------------------+-------------------+-------------------+-------------------+
 0.   |                                      *                                       |
 25.u |                                    .   *                                     |
 50.u |                                  .       .                                   |
 75.u |                                .           .                                 |
100.u |                              .               .                               |
125.u |                            .                   .                             |
150.u |                          .                       .                           |
175.u |                        .                           .                         |
200.u |                      .                               .                       |
225.u |                    .                                   .                     |
250.u |                  .                                       .                   |
275.u |                .                                           .                 |
300.u |              .                                               .               |
325.u |            .                                                   .             |
350.u |          .                                                       .           |
375.u |        .                                                           .         |
400.u |      .                                                               .       |
425.u |    .                                                                   .     |
450.u |  .                                                                       .   |
475.u |.                                                                           . |
500.u |                                                                            . |
525.u |                                                                          .   |
550.u |                                                                        .     |
575.u |                                                                      .       |
600.u |                                                                    .         |
625.u |                                                                  .           |
650.u |                                                                .             |
675.u |                                                              .               |
700.u |                                                            .                 |
725.u |                                                          .                   |
750.u |                                                        .                     |
775.u |                                                      .                       |
800.u |                                                    .                         |
825.u |                                                  .                           |
850.u |                                                .                             |
875.u |                                              .                               |
900.u |                                            .                                 |
925.u |                                          .                                   |
950.u |                                        .                                     |
975.u |                                      .                                       |
0.001 |                                    .                                         |
      +------------------+-------------------+-------------------+-------------------+
```

```
475.u |                                                                          .   |
500.u |                                                                        .     |
525.u |                                                                      .       |
550.u |                                                                    .         |
575.u |                                                                  .           |
600.u |                                                                .             |
625.u |                                                              .               |
650.u |                                                            .                 |
675.u |                                                          .                   |
700.u |                                                        .                     |
725.u |                                                      .                       |
750.u |                                                    .                         |
775.u |                                                  .                           |
800.u |                                                .                             |
825.u |                                              .                               |
850.u |                                            .                                 |
875.u |                                          .                                   |
900.u |                                        .                                     |
925.u |                                      .                                       |
950.u |                                    .                                         |
975.u |                                  .                                           |
0.001 |                                .                                             |
      +------------------+-------------------+-------------------+-------------------+
```

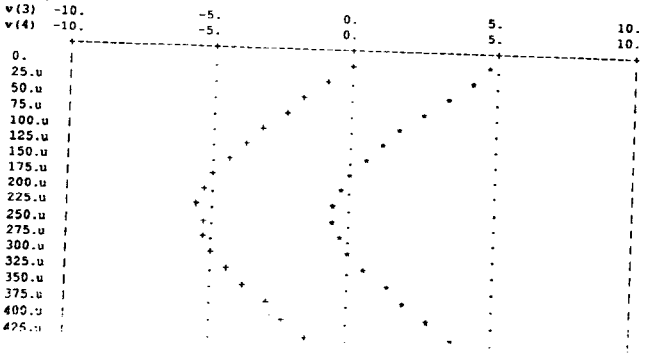
```
gnucap> print four v(4)
gnucap> four 1k
#Time       v(4)
 0.001      -0.071304
 0.0010312  -0.26149
 0.0010625  -0.44376
 0.0010937  -0.61034
 0.001125   -0.75382
 0.0011562  -0.86761
 0.0011875  -0.9464
 0.0012187  -0.98644
 0.00125    -0.98587
 0.0012812  -0.94477
 0.0013125  -0.86517
 0.0013437  -0.75092
 0.001375   -0.60739
 0.0014062  -0.44117
 0.0014375  -0.25957
 0.0014687  -0.070274
 0.0015      0.11908
 0.0015312   0.30127
 0.0015625   0.46973
 0.0015937   0.61877
 0.001625    0.74365
 0.0016562   0.84061
 0.0016875   0.9069
 0.0017187   0.94068
 0.00175     0.94102
 0.0017812   0.90786
 0.0018125   0.84203
 0.0018437   0.74526
 0.001875    0.62029
 0.0019062   0.47084
 0.0019375   0.30169
 0.0019687   0.11862
 0.002      -0.071697
# v(4)       --------- actual ---------  -------- relative --------
#freq        value       dB       phase  value       dB       phase
 0.          688.04u    -63.25    90.000  710.67u    -62.97   -95.650
 1.K         0.96816     -0.28  -174.350  1.           0.00     0.000
 2.K         0.023827   -32.46   103.975  0.02461    -32.18   -81.675
 3.K         58.783u    -84.61    89.753  60.716u    -84.33   -95.897
 4.K         32.173u    -89.85    21.832  33.231u    -89.57  -163.818
 5.K         25.835u    -91.76    25.811  26.684u    -91.47  -159.840
 6.K         21.581u    -93.32    31.858  22.291u    -93.04  -153.792
 7.K         18.71u     -94.56    38.193  19.326u    -94.28  -147.458
 8.K         16.713u    -95.54    44.679  17.262u    -95.26  -140.971
 9.K         15.317u    -96.30    51.180  15.82u     -96.02  -134.470
gnucap>
gnucap> tr0
#Time       v(1)        v(2)        v(3)        v(4)        v(5)        v(6)
 0.          0.         -4.6         5.         -27.965u     10.        -10.
 25.u        0.0015643  -4.6         4.8436     -0.15261     10.        -10.
 50.u        0.0030902  -4.6         4.6912     -0.30122     10.        -10.
 75.u        0.0045399  -4.5999      4.547      -0.44185     10.        -10.
 100.u       0.0058779  -4.5998      4.4149     -0.5706      10.        -10.
 125.u       0.0070711  -4.5997      4.2988     -0.68376     10.        -10.
 150.u       0.0080902  -4.5996      4.2021     -0.77804     10.        -10.
 175.u       0.0089101  -4.5995      4.1276     -0.85063     10.        -10.
 200.u       0.0095106  -4.5993      4.0776     -0.89936     10.        -10.
 225.u       0.0098769  -4.5992      4.0536     -0.92276     10.        -10.
 250.u       0.01       -4.599       4.0563     -0.92016     10.        -10.
 275.u       0.0098769  -4.5989      4.0855     -0.89171     10.        -10.
 300.u       0.0095106  -4.5987      4.1402     -0.83834     10.        -10.
 325.u       0.0089101  -4.5986      4.2188     -0.76173     10.        -10.
 350.u       0.0080902  -4.5985      4.3188     -0.66428     10.        -10.
 375.u       0.0070711  -4.5984      4.4372     -0.54891     10.        -10.
 400.u       0.0058779  -4.5983      4.5704     -0.41903     10.        -10.
 425.u       0.0045399  -4.5983      4.7146     -0.27837     10.        -10.
 450.u       0.0030902  -4.5982      4.8659     -0.1308      10.        -10.
 475.u       0.0015643  -4.5982      5.0202      0.019741    10.        -10.
 500.u       0.         -4.5982      5.1736      0.1694      10.        -10.
 525.u      -0.0015643  -4.5983      5.3223      0.31451     10.        -10.
 550.u      -0.0030902  -4.5983      5.4629      0.4517      10.        -10.
 575.u      -0.0045399  -4.5984      5.5922      0.57791     10.        -10.
 600.u      -0.0058779  -4.5985      5.7075      0.69049     10.        -10.
 625.u      -0.0070711  -4.5987      5.8065      0.78716     10.        -10.
 650.u      -0.0080902  -4.5988      5.8873      0.86606     10.        -10.
 675.u      -0.0089101  -4.5989      5.9484      0.92574     10.        -10.
 700.u      -0.0095106  -4.5991      5.9887      0.96512     10.        -10.
 725.u      -0.0098769  -4.5992      6.0075      0.98349     10.        -10.
 750.u      -0.01       -4.5994      6.0044      0.98051     10.        -10.
 775.u      -0.0098769  -4.5995      5.9795      0.95618     10.        -10.
 800.u      -0.0095106  -4.5997      5.9332      0.91088     10.        -10.
 825.u      -0.0089101  -4.5998      5.866       0.84534     10.        -10.
 850.u      -0.0080902  -4.6         5.7794      0.76068     10.        -10.
 875.u      -0.0070711  -4.6001      5.6746      0.65844     10.        -10.
 900.u      -0.0058779  -4.6002      5.5539      0.54057     10.        -10.
 925.u      -0.0045399  -4.6003      5.4196      0.40944     10.        -10.
 950.u      -0.0030902  -4.6003      5.2745      0.26784     10.        -10.
 975.u      -0.0015643  -4.6003      5.1219      0.11898     10.        -10.
 0.001       0.         -4.6003      4.9655     -0.033634    10.        -10.
gnucap> gen
freq= 1.K  ampl= 0.01  phase= 0.  max= 1.  min= 0.  offset= 0.
+  init= 0.  rise= 1.p  fall= 1.p  delay= 0.  width= 0.  period= 0.
gnucap> gen ampl=.05
gnucap> plot tran v(4)(-6,6)
gnucap> tr0
```

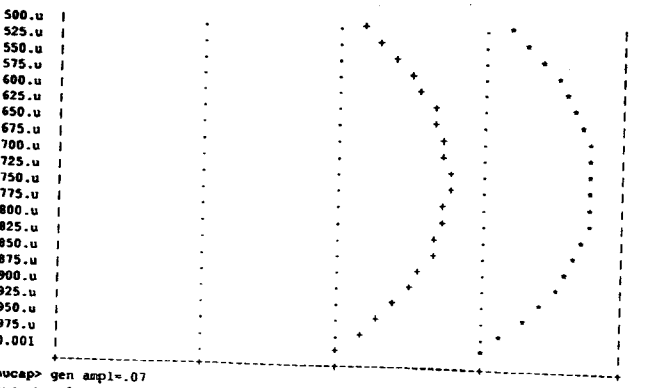



```
gnucap> plot tran v(4)(-10,10)
gnucap> gen
freq= 1.K  ampl= 0.05  phase= 0.  max= 1.  min= 0.  offset= 0.
+  init= 0.  rise= 1.p  fall= 1.p  delay= 0.  width= 0.  period= 0.
gnucap> gen ampl=.1
gnucap> plot tran v(3)(-10,10)
gnucap> plot tran + v(4)(-10,10)
gnucap> tr0
v(3)  -10.          -5.          0.          5.          10.
v(4)  -10.          -5.          0.          5.          10.
```




```
gnucap> gen
freq= 1.K  ampl= 0.1  phase= 0.  max= 1.  min= 0.  offset= 0.
+  init= 0.  rise= 1.p  fall= 1.p  delay= 0.  width= 0.  period= 0.
gnucap> gen ampl=.05
gnucap> tr0
v(3)  -10.          -5.          0.          5.          10.
v(4)  -10.          -5.          0.          5.          10.
```






```
gnucap> gen ampl=.07
gnucap> tr0
v(3)  -10.          -5.          0.          5.          10.
v(4)  -10.          -5.          0.          5.          10.
```