A3

RR

```
[1209] Inside exit() for name benchmark pid 5 with overall runtime 159 || and overall wait time 793 || turnaround-time: 952
[1215] Inside exit() for name benchmark pid 7 with overall runtime 159 || and overall wait time 796 || turnaround-time: 955
[1221] Inside exit() for name benchmark pid 4 with overall runtime 162 || and overall wait time 803 || turnaround-time: 965
[1221] Inside exit() for name benchmark pid 6 with overall runtime 161 || and overall wait time 803 || turnaround-time: 964
[1222] Inside exit() for name benchmark pid 9 with overall runtime 161 || and overall wait time 801 || turnaround-time: 962
[1222] Inside exit() for name benchmark pid 8 with overall runtime 162 || and overall wait time 800 || turnaround-time: 962
[1223] Inside exit() for name benchmark pid 3 with overall runtime 3 || and overall wait time 10 || turnaround-time: 968
```

FCFS

```
init: starting sh
$ benchmark
[399] Inside exit() for name benchmark pid 4 with overall runtime 160 || and overall wait time 2 || turnaround-time: 162
[558] Inside exit() for name benchmark pid 5 with overall runtime 159 || and overall wait time 162 || turnaround-time: 321
[720] Inside exit() for name benchmark pid 6 with overall runtime 161 || and overall wait time 321 || turnaround-time: 482
[881] Inside exit() for name benchmark pid 7 with overall runtime 161 || and overall wait time 482 || turnaround-time: 643
[1040] Inside exit() for name benchmark pid 8 with overall runtime 159 || and overall wait time 643 || turnaround-time: 802
[1200] Inside exit() for name benchmark pid 9 with overall runtime 160 || and overall wait time 801 || turnaround-time: 961
[1200] Inside exit() for name benchmark pid 3 with overall runtime 4 || and overall wait time 0 || turnaround-time: 964
```

PBS

```
[747] Inside exit() for name benchmark pid 7 with overall runtime 165 || and overall wait time 332 || turnaround-time: 497
[749] Inside exit() for name benchmark pid 5 with overall runtime 167 || and overall wait time 333 || turnaround-time: 500
[749] Inside exit() for name benchmark pid 9 with overall runtime 166 || and overall wait time 332 || turnaround-time: 498
[1239] Inside exit() for name benchmark pid 4 with overall runtime 163 || and overall wait time 828 || turnaround-time: 991
[1241] Inside exit() for name benchmark pid 8 with overall runtime 163 || and overall wait time 828 || turnaround-time: 991
[1244] Inside exit() for name benchmark pid 6 with overall runtime 166 || and overall wait time 829 || turnaround-time: 995
[1244] Inside exit() for name benchmark pid 3 with overall runtime 4 || and overall wait time 2 || turnaround-time: 997
```

A6 (benchmark)

Nature for 1st 3 methods is that every program is CPU intensive.
FOR MLFQ, alternate procedures are IO and CPU intensive. Also, the IO (with some CPU time) and CPU times (loop iterations have been tried to be made variable). Expected behavior is that IO intensive processes must complete first and must be within the top queues.

RR

As expected,
Waiting time: uniform for all processes
Turnaround time: uniform for all processes

```
$ benchmark
[3913] Inside exit() for name benchmark pid 5 with overall runtime 445 || and overall wait time 3109 || turnaround-time: 3554
[3935] Inside exit() for name benchmark pid 7 with overall runtime 447 || and overall wait time 3126 || turnaround-time: 3573
[3938] Inside exit() for name benchmark pid 11 with overall runtime 446 || and overall wait time 3124 || turnaround-time: 3570
[3939] Inside exit() for name benchmark pid 4 with overall runtime 449 || and overall wait time 3132 || turnaround-time: 3581
[3940] Inside exit() for name benchmark pid 8 with overall runtime 448 || and overall wait time 3130 || turnaround-time: 3578
[3943] Inside exit() for name benchmark pid 9 with overall runtime 448 || and overall wait time 3133 || turnaround-time: 3581
[3943] Inside exit() for name benchmark pid 10 with overall runtime 448 || and overall wait time 3127 || turnaround-time: 3575
[3944] Inside exit() for name benchmark pid 6 with overall runtime 451 || and overall wait time 3134 || turnaround-time: 3585
[3944] Inside exit() for name benchmark pid 3 with overall runtime 4 || and overall wait time 20 || turnaround-time: 3587
```

FCFS

As expected,
Waiting time: increasing as arrival time increases
Turnaround time: increasing as arrival time increases

```
[741] Inside exit() for name benchmark pid 4 with overall runtime 422 || and overall wait time 3 || turnaround-time: 425
[1147] Inside exit() for name benchmark pid 5 with overall runtime 406 || and overall wait time 425 || turnaround-time: 831
[1554] Inside exit() for name benchmark pid 6 with overall runtime 407 || and overall wait time 830 || turnaround-time: 1237
[1961] Inside exit() for name benchmark pid 7 with overall runtime 407 || and overall wait time 1237 || turnaround-time: 1644
[2363] Inside exit() for name benchmark pid 8 with overall runtime 402 || and overall wait time 1643 || turnaround-time: 2045
[2771] Inside exit() for name benchmark pid 9 with overall runtime 407 || and overall wait time 2046 || turnaround-time: 2453
[3166] Inside exit() for name benchmark pid 10 with overall runtime 395 || and overall wait time 2453 || turnaround-time: 2848
[3575] Inside exit() for name benchmark pid 11 with overall runtime 409 || and overall wait time 2847 || turnaround-time: 3256
[3576] Inside exit() for name benchmark pid 3 with overall runtime 3 || and overall wait time 2 || turnaround-time: 3261
```

PBS

As expected,
Waiting time: IS MORE FOR EVEN numbered processes as they have lesser priority and have to wait for odd numbered processes to conclude.

Turnaround time: IS MORE FOR EVEN numbered processes as they have lesser priority and have to wait for odd numbered processes to conclude. However, within the same parity processes, wait times and turnaround times are uniform as they run in RR fashion within themselves.

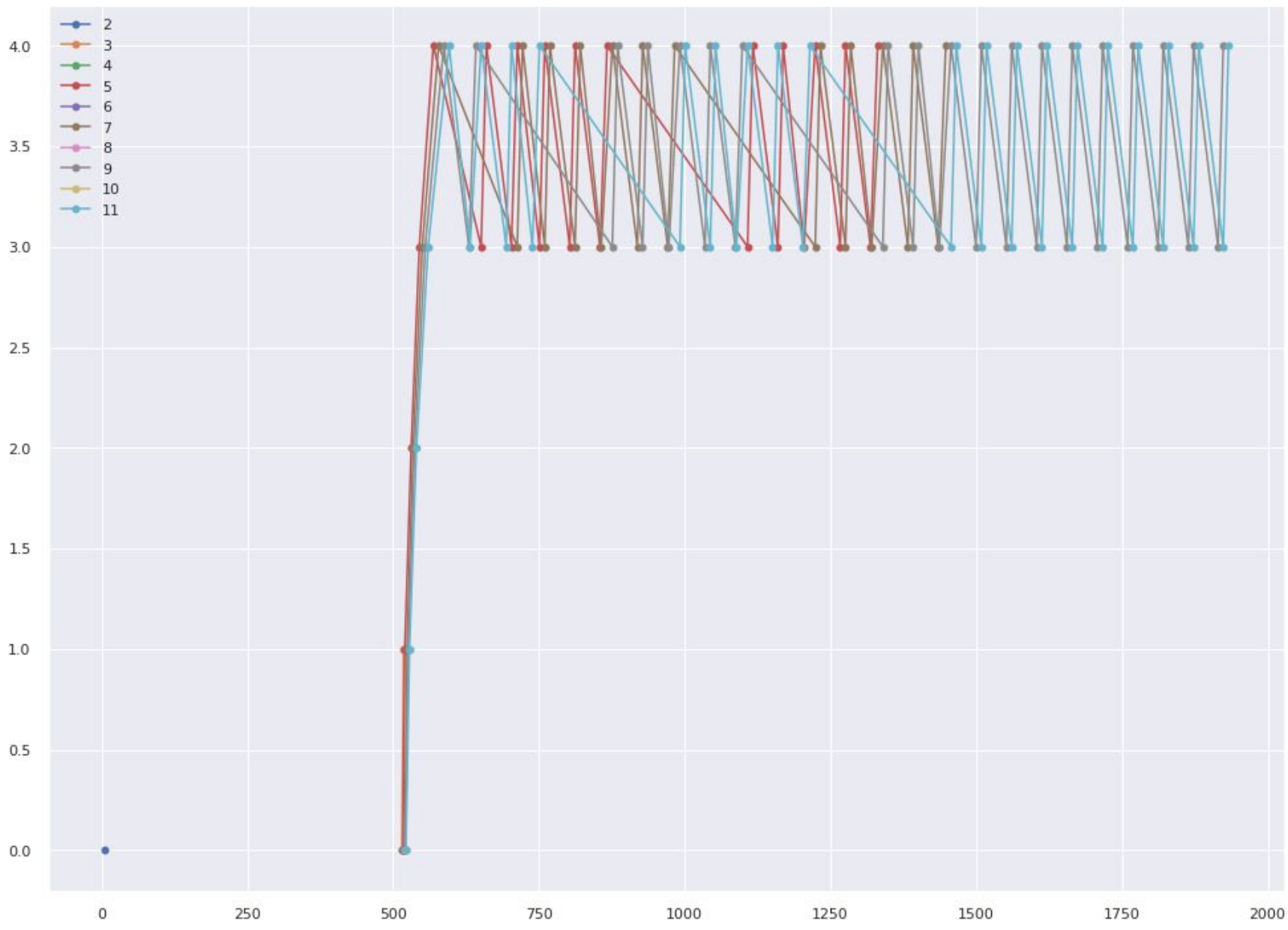
```
[1997] Inside exit() for name benchmark pid 11 with overall runtime 409 || and overall wait time 1231 || turnaround-time: 1640
[2000] Inside exit() for name benchmark pid 5 with overall runtime 411 || and overall wait time 1234 || turnaround-time: 1645
[2002] Inside exit() for name benchmark pid 7 with overall runtime 412 || and overall wait time 1234 || turnaround-time: 1646
[2004] Inside exit() for name benchmark pid 9 with overall runtime 414 || and overall wait time 1233 || turnaround-time: 1647
[3575] Inside exit() for name benchmark pid 10 with overall runtime 392 || and overall wait time 2826 || turnaround-time: 3218
[3577] Inside exit() for name benchmark pid 6 with overall runtime 393 || and overall wait time 2828 || turnaround-time: 3221
[3582] Inside exit() for name benchmark pid 8 with overall runtime 395 || and overall wait time 2831 || turnaround-time: 3226
[3584] Inside exit() for name benchmark pid 4 with overall runtime 399 || and overall wait time 2830 || turnaround-time: 3229
[3585] Inside exit() for name benchmark pid 3 with overall runtime 6 || and overall wait time 1 || turnaround-time: 3232
```

MLFQ

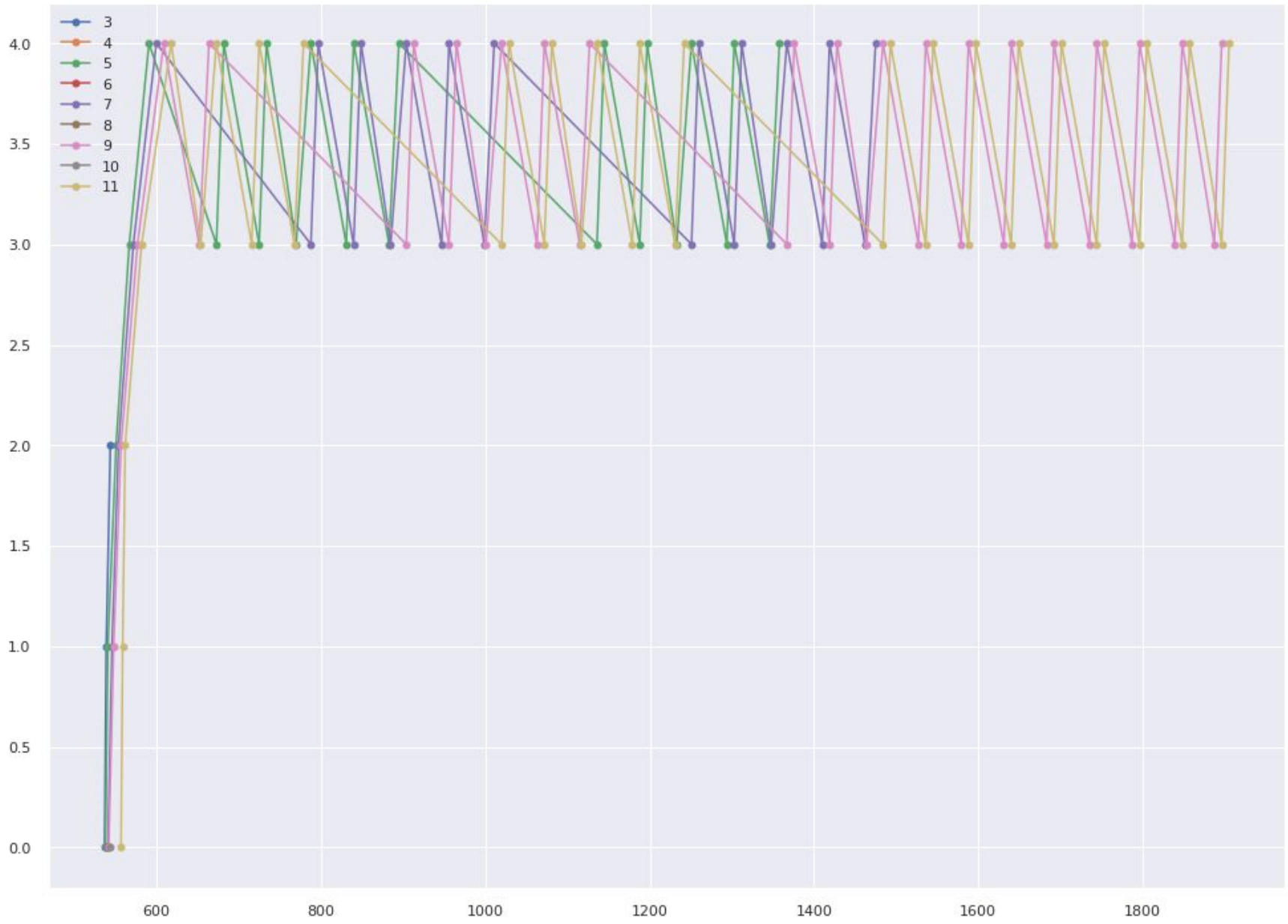
For mlfq,as expected, the even numbered IO intensive processes which have relatively less CPU time complete earlier as they keep relinquishing the CPU for sleep and have higher priority. However, if a IO process sleeps for too long, it is possible that CPU processes finish their work before IO processes resume (after wakeup or input from the user).

```
[1122] Inside exit() for name benchmark pid 4 with overall runtime 0 || and overall wait time 834 || turnaround-time: 920
[1123] Inside exit() for name benchmark pid 6 with overall runtime 8 || and overall wait time 826 || turnaround-time: 919
[1124] Inside exit() for name benchmark pid 8 with overall runtime 5 || and overall wait time 833 || turnaround-time: 920
[1125] Inside exit() for name benchmark pid 10 with overall runtime 5 || and overall wait time 837 || turnaround-time: 920
[1516] Inside exit() for name benchmark pid 5 with overall runtime 347 || and overall wait time 966 || turnaround-time: 1313
[1570] Inside exit() for name benchmark pid 7 with overall runtime 367 || and overall wait time 999 || turnaround-time: 1366
[1651] Inside exit() for name benchmark pid 9 with overall runtime 363 || and overall wait time 1083 || turnaround-time: 1446
[1664] Inside exit() for name benchmark pid 11 with overall runtime 362 || and overall wait time 1096 || turnaround-time: 1458
[1664] Inside exit() for name benchmark pid 3 with overall runtime 5 || and overall wait time 4 || turnaround-time: 1463
```

WHEN IO PROCESSES have little CPU time, even they get demoted



HERE IO PROCESSES don’t move from queue 0and hence, aren’t visible in the graph



FOR MLFQ

A2_code.c