Homework 1

Parallel Distributed Num Algorithms
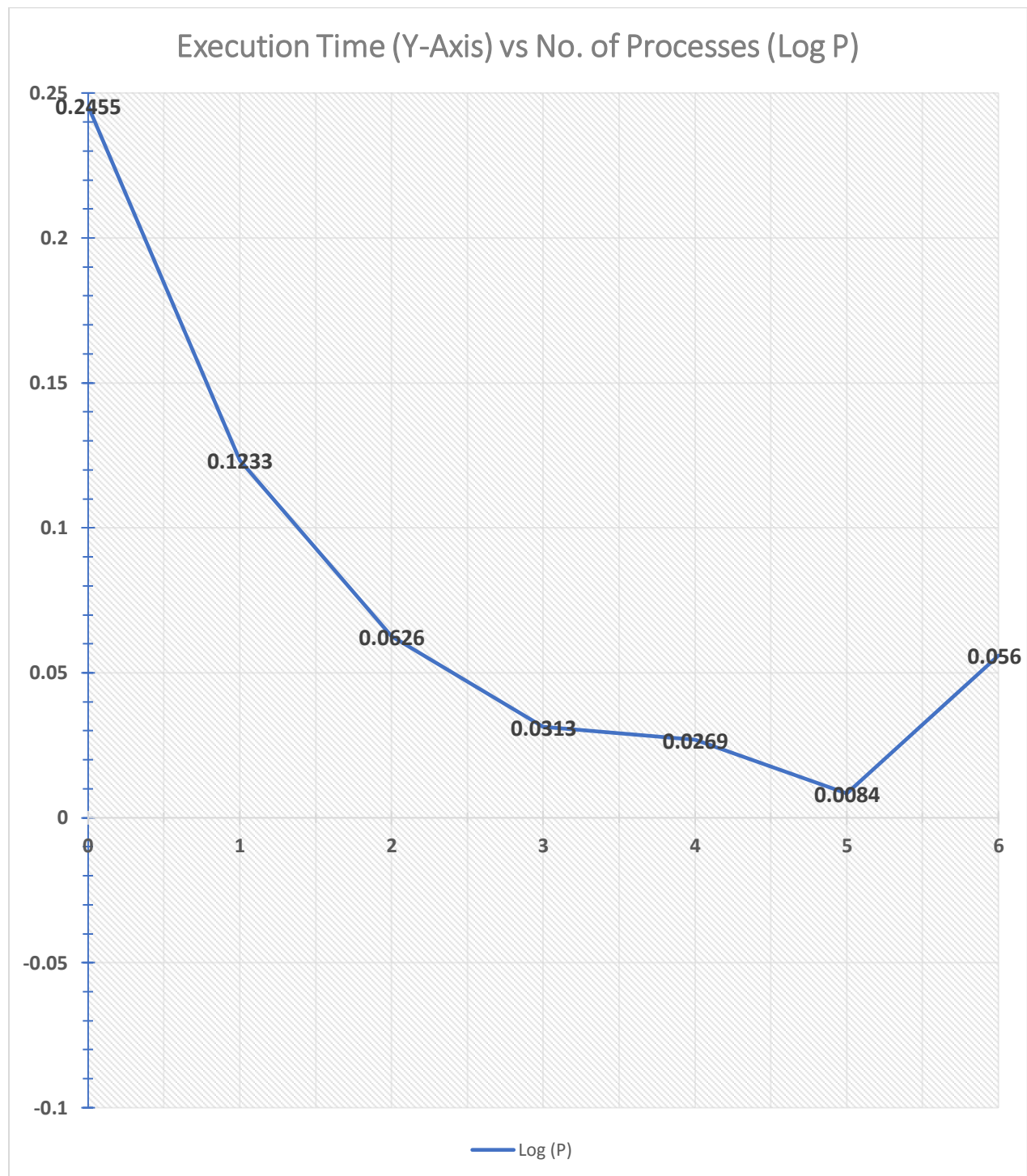
Name: **Saurabh Kumar**
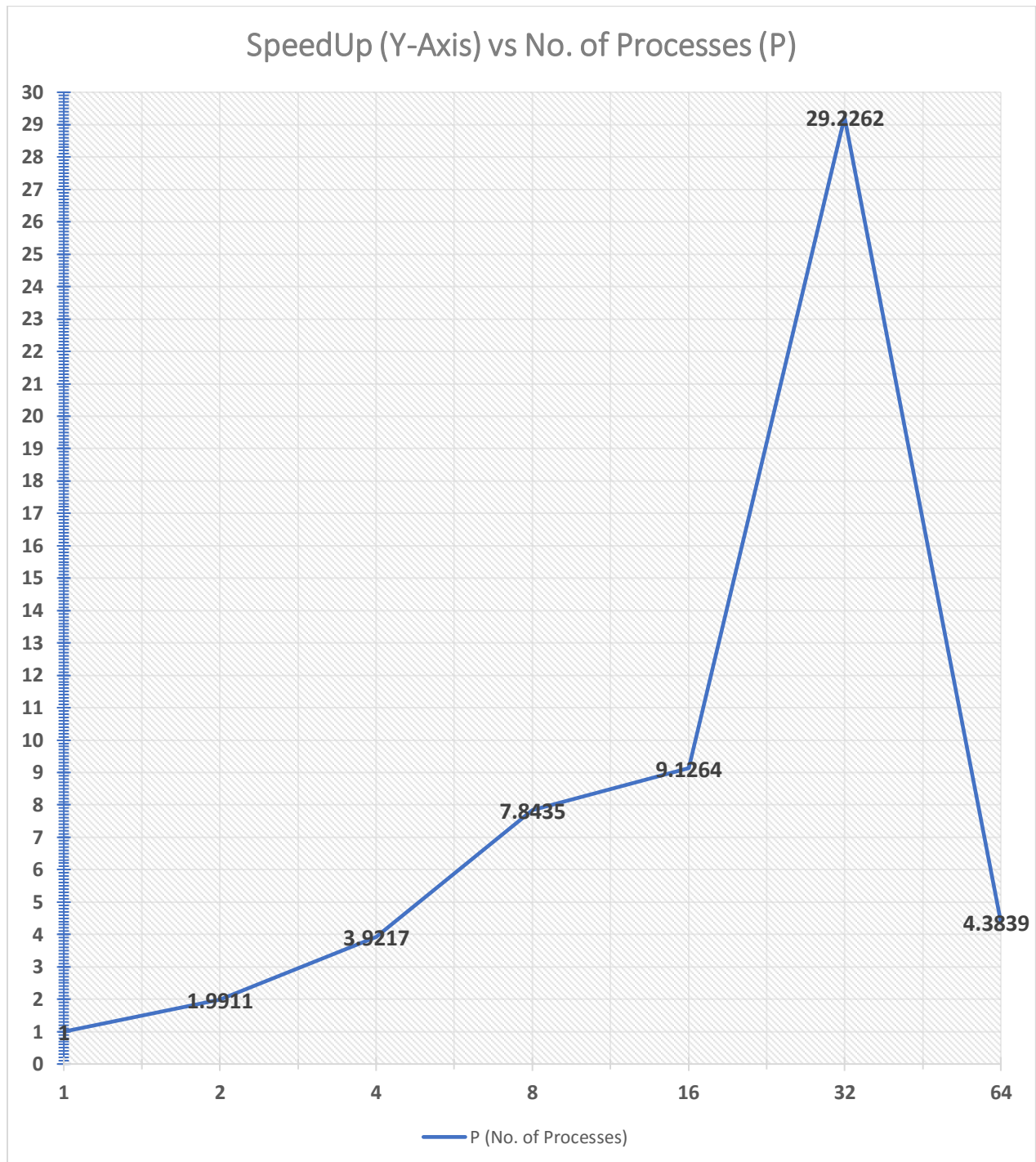**UIN: 926009924**

Execution Data Summary:

P	Execution Time	Speed Up	Efficiency	n	ptile
1	0.2455	1	1	10^8	4
2	0.1233	1.9911	.9955	10^8	4
4	0.0626	3.9217	.9804	10^8	4
8	0.0313	7.8435	.9804	10^8	4
16	0.0269	9.1264	.5704	10^8	4
32	0.0084	29.2262	.9133	10^8	4
64	0.0560	4.3839	.0685	10^8	4

1. Plot execution time versus p to demonstrate how time varies with the number of processes. Use a logarithmic scale for the x axis.

Execution Time (Y-Axis) vs No. of Processes (Log P)

2. Plot speedup versus p to demonstrate the change in speedup with p.

SpeedUp (Y-Axis) vs No. of Processes (P)

- 29.2262
- 9.1264
- 7.8435
- 3.9217
- 1.9911
- 1
- 4.3839

X-axis: P (No. of Processes): 1, 2, 4, 8, 16, 32, 64

3. Using the definition: efficiency = speedup/p, plot efficiency versus p to demonstrate how efficiency changes as the number of processes is increased.

Efficiency(Y-Axis) vs No. of Processes (P)
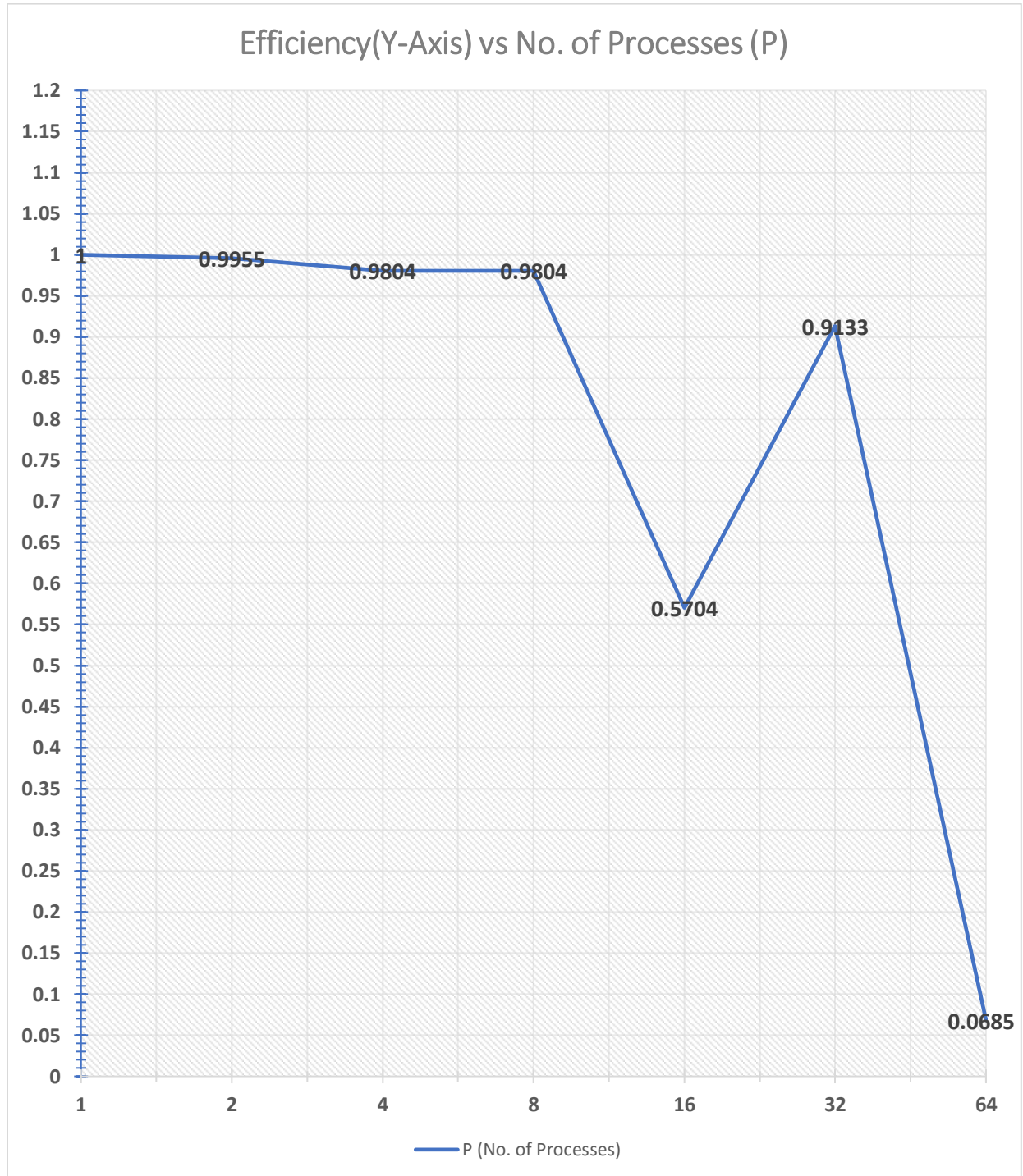
4. What value of p minimizes the parallel runtime?

Answer: P = 32

5. With $n=10^8$ and p=64, determine the value of ptile that minimizes the total_time. Plot time versus ptile to illustrate your experimental results for this question.

Answer: The value of ptile which gave me the lowest execution time is **ptile=9**

Execution Data Summary:

ptile	Execution Time	N	p
1	0.0943	10^8	64
2	0.0977	10^8	64
3	0.0531	10^8	64
4	0.0511	10^8	64
5	0.0222	10^8	64
6	0.0387	10^8	64
7	0.0193	10^8	64
8	0.0278	10^8	64
9	0.0163	10^8	64
10	0.0225	10^8	64

Execution Time(Y-Axis) vs ptile (X-Axis)

0.0943
0.0977
0.0531
0.0511
0.0387
0.0222
0.0278
0.0193
0.0225
0.0163
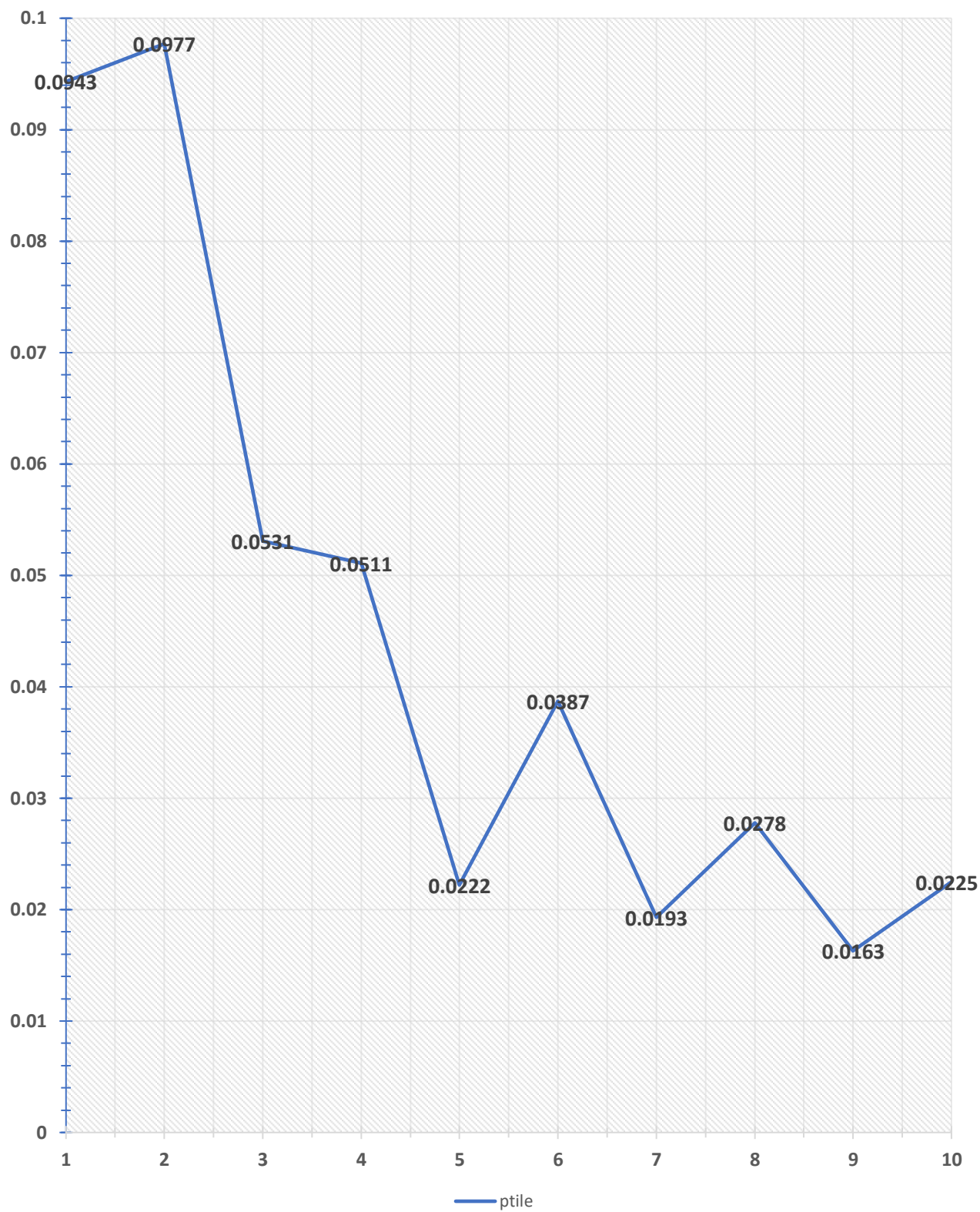
ptile

6. Repeat the experiments with p=64 for n=10^2, 10^4, 10^6 and 10^8.

a. Plot the speedup observed w.r.t. p=1 versus n.

Execution Data Summary:

P	Execution Time	Speed Up	Efficiency	n	ptile
64	0.0643	.0016	.000025	10^2	4
64	0.0716	.0014	.000022	10^4	4
64	0.0558	.0449	.0007	10^6	4
64	0.0670	3.6627	.0572	10^8	4
1	.0001	1	1	10^2	4
1	.0001	1	1	10^4	4
1	.0025	1	1	10^6	4
1	.2454	1	1	10^8	4

SpeedUp(Y-Axis) vs n (X-Axis)
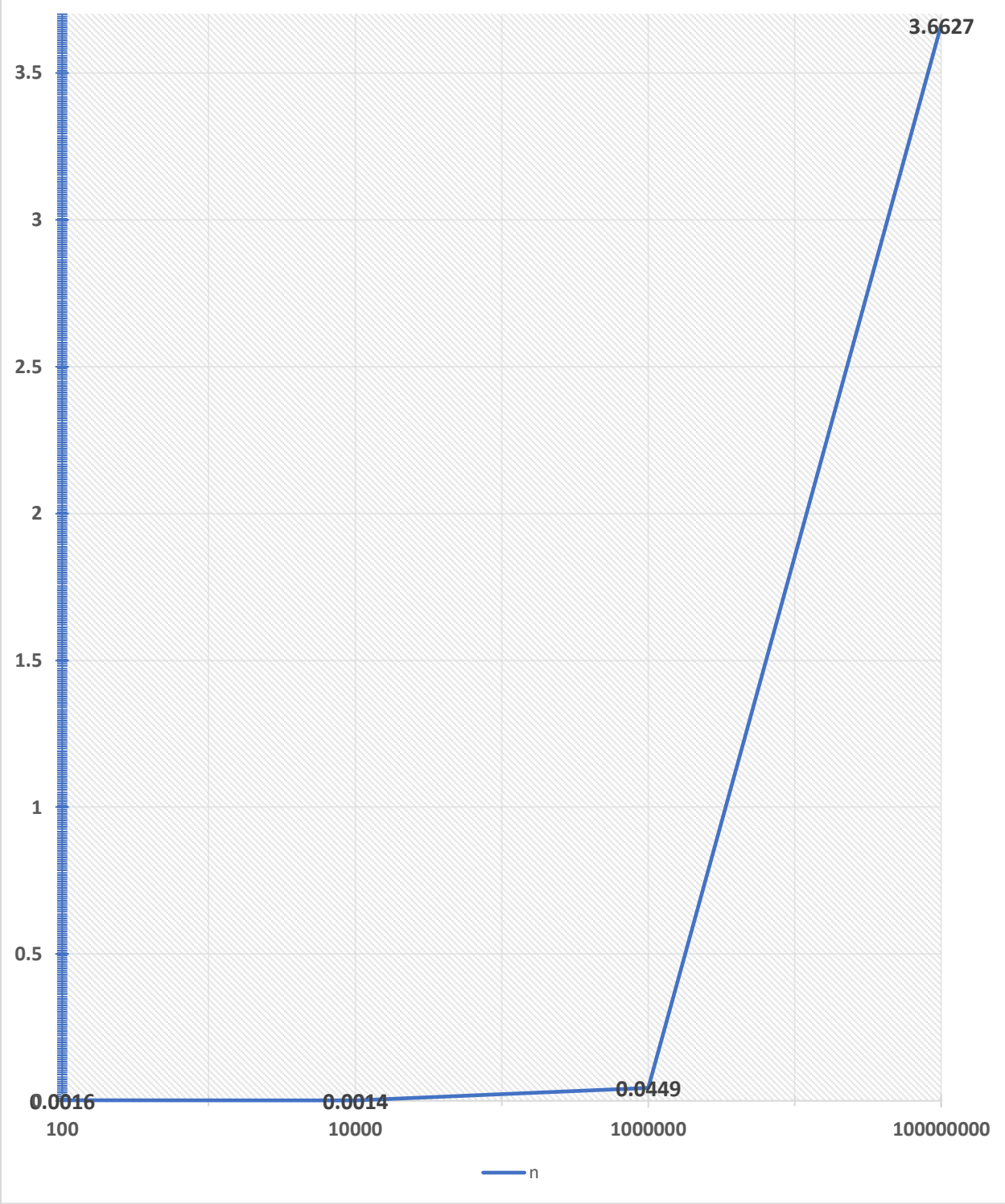
b. Plot the relative error versus n to illustrate the accuracy of the algorithm as a function of n.

Execution Data Summary:

P	Execution Time	Speed Up	Efficiency	n	ptile	Relative Error
64	0.0643	.0016	.000025	10^2	4	$2.65 * 10^{-6}$
64	0.0716	.0014	.000022	10^4	4	$2.65 * 10^{-10}$
64	0.0558	.0449	.0007	10^6	4	$2.63 * 10^{-14}$
64	0.0670	3.6627	.0572	10^8	4	$7.07 * 10^{-16}$

Relative Error(Y-Axis) vs n (X-Axis)