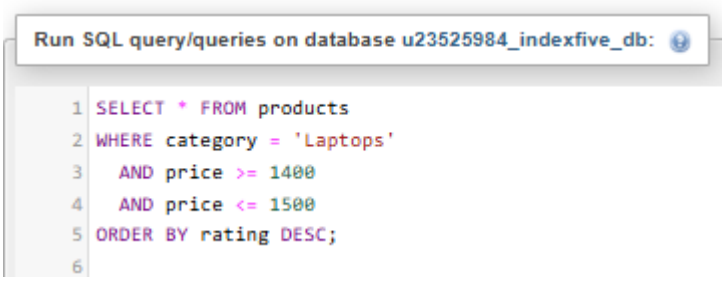
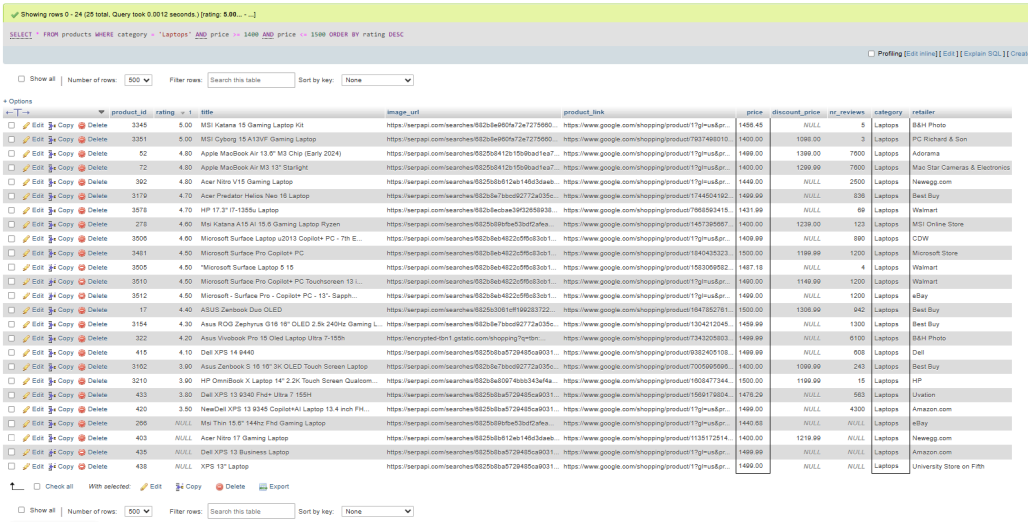
Task 7: Analyse and Optimize

Selected Query(from products.php, getProducts($db,$input):

```
SELECT * FROM products
WHERE category = ?
  AND price >= ?
  AND price <= ?
ORDER BY price | rating | nr_reviews ASC/DESC
```

Test Query (to show it works):





Explain Query:

Run SQL query/queries on database u23525984_indexfive_db:

```
1 EXPLAIN SELECT * FROM products
2 WHERE category = 'Electronics'
3   AND price >= 1400
4   AND price <= 1500
5 ORDER BY rating DESC;
6
```

Your SQL query has been executed successfully.

```
EXPLAIN SELECT * FROM products WHERE category = 'Electronics' AND price >= 1400 AND price <= 1500 ORDER BY rating DESC
```

+ Options

id	select_type	table	type	possible_keys	key	key_len	ref	rows	Extra
1	SIMPLE	products	ALL	*NULL*	*NULL*	*NULL*	*NULL*	4938	Using where; Using filesort

What does this mean:

- Type = ALL:
  - This is scanning all rows in the products table (rows = 4983) which is very inefficient.
- Key = NULL:
  - No indexing is being used.
- Using filesort:
  - This appears when using “SELECT *”.
  - MYSQL is sorting the data in memory.

Initial optimization:

- Add a composite index only used for this sorting.

Run SQL query/queries on database u23525984_indexfive_db:

```
1 CREATE INDEX idx_sort
2 ON products (category, price, rating DESC);
3
```

Run SQL query/queries on database u23525984_indexfive_db:

```
1 EXPLAIN SELECT * FROM products
2 WHERE category = 'Laptops'
3   AND price >= 1400
4   AND price <= 1500
5 ORDER BY rating DESC;
6
```

Your SQL query has been executed successfully.

```
EXPLAIN SELECT * FROM products WHERE category = 'Laptops' AND price >= 1400 AND price <= 1500 ORDER BY rating DESC
```

+ Options

id	select_type	table	type	possible_keys	key	key_len	ref	rows	Extra
1	SIMPLE	products	range	idx_sort	idx_sort	1029	*NULL*	25	Using index condition; Using filesort

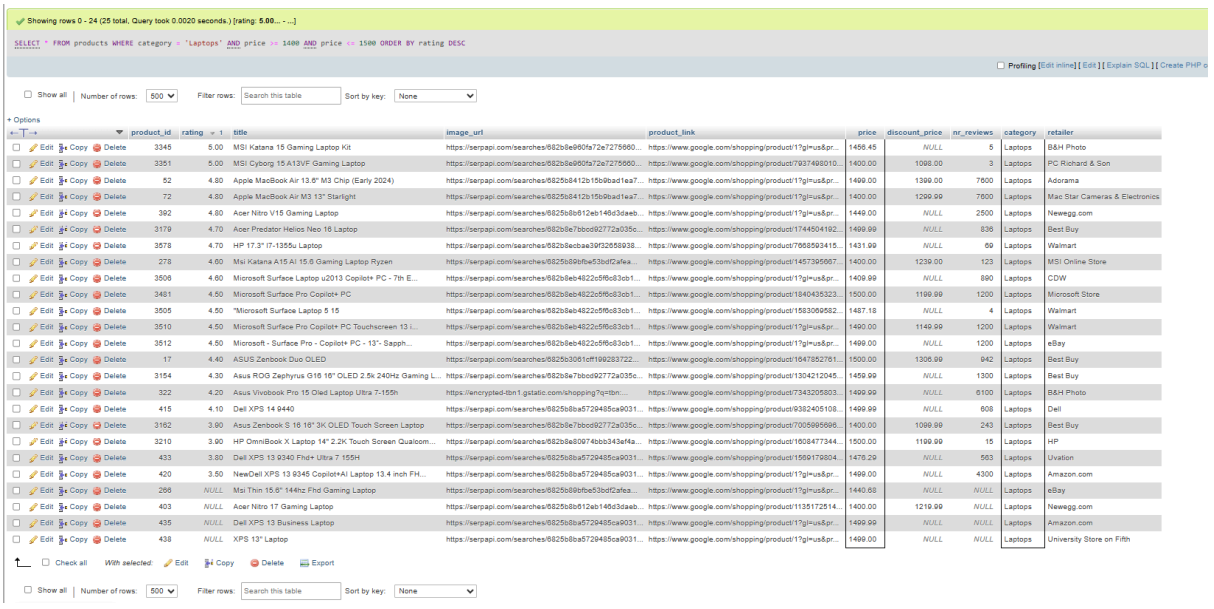
Type = range:

- This is more efficient as it is now only looking through that index (rows = 25) and getting the same results as before.

Key = idx_sort:

- Indexing is being used, so that there is less data to look through.

Ran the query again to check and it only used the 25 rows from the index:

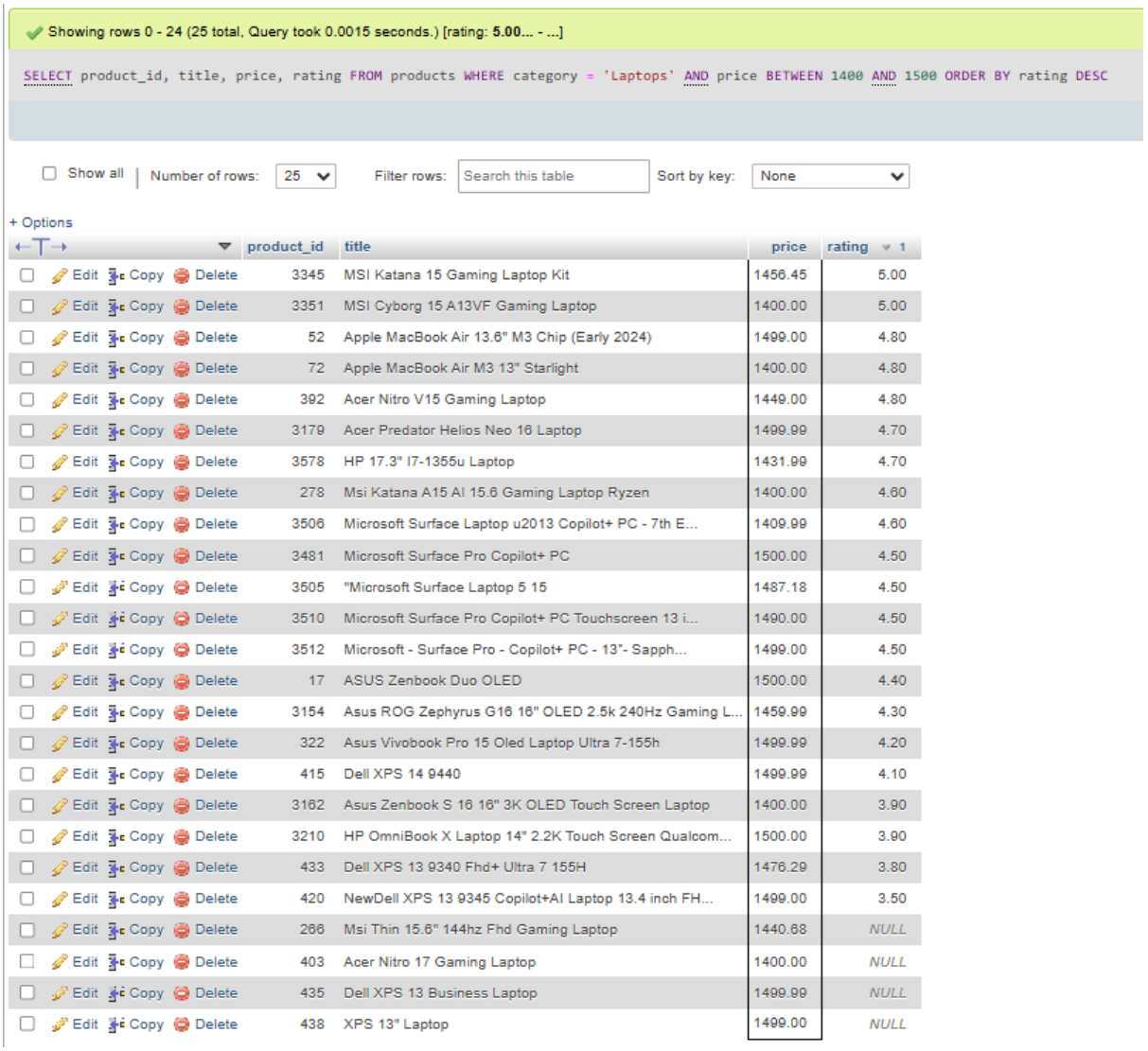


Further optimisation:

- Only Query using necessary columns

Run SQL query/queries on database u23525984_indexfive_db:

```
SELECT product_id, title, price, rating
FROM products
WHERE category = 'Laptops'
  AND price BETWEEN 1400 AND 1500
ORDER BY rating DESC;
```



Showing rows 0 - 24 (25 total, Query took 0.0015 seconds.) [rating: 5.00... - ...]

```
SELECT product_id, title, price, rating FROM products WHERE category = 'Laptops' AND price BETWEEN 1400 AND 1500 ORDER BY rating DESC
```

Show all | Number of rows: 25 Filter rows: Search this table Sort by key: None

+ Options

	product_id	title	price	rating
Edit Copy Delete	3345	MSI Katana 15 Gaming Laptop Kit	1456.45	5.00
Edit Copy Delete	3351	MSI Cyborg 15 A13VF Gaming Laptop	1400.00	5.00
Edit Copy Delete	52	Apple MacBook Air 13.6" M3 Chip (Early 2024)	1499.00	4.80
Edit Copy Delete	72	Apple MacBook Air M3 13" Starlight	1400.00	4.80
Edit Copy Delete	392	Acer Nitro V15 Gaming Laptop	1449.00	4.80
Edit Copy Delete	3179	Acer Predator Helios Neo 16 Laptop	1499.99	4.70
Edit Copy Delete	3578	HP 17.3" I7-1355u Laptop	1431.99	4.70
Edit Copy Delete	278	Msi Katana A15 AI 15.6 Gaming Laptop Ryzen	1400.00	4.60
Edit Copy Delete	3506	Microsoft Surface Laptop u2013 Copilot+ PC - 7th E...	1409.99	4.60
Edit Copy Delete	3481	Microsoft Surface Pro Copilot+ PC	1500.00	4.50
Edit Copy Delete	3505	"Microsoft Surface Laptop 5 15	1487.18	4.50
Edit Copy Delete	3510	Microsoft Surface Pro Copilot+ PC Touchscreen 13 i...	1490.00	4.50
Edit Copy Delete	3512	Microsoft - Surface Pro - Copilot+ PC - 13"- Sapph...	1499.00	4.50
Edit Copy Delete	17	ASUS Zenbook Duo OLED	1500.00	4.40
Edit Copy Delete	3154	Asus ROG Zephyrus G16 16" OLED 2.5k 240Hz Gaming L...	1459.99	4.30
Edit Copy Delete	322	Asus Vivobook Pro 15 Oled Laptop Ultra 7-155h	1499.99	4.20
Edit Copy Delete	415	Dell XPS 14 9440	1499.99	4.10
Edit Copy Delete	3162	Asus Zenbook S 16 16" 3K OLED Touch Screen Laptop	1400.00	3.90
Edit Copy Delete	3210	HP OmniBook X Laptop 14" 2.2K Touch Screen Qualcom...	1500.00	3.90
Edit Copy Delete	433	Dell XPS 13 9340 Fhd+ Ultra 7 155H	1476.29	3.80
Edit Copy Delete	420	NewDell XPS 13 9345 Copilot+AI Laptop 13.4 inch FH...	1499.00	3.50
Edit Copy Delete	266	Msi Thin 15.6" 144hz Fhd Gaming Laptop	1440.68	NULL
Edit Copy Delete	403	Acer Nitro 17 Gaming Laptop	1400.00	NULL
Edit Copy Delete	435	Dell XPS 13 Business Laptop	1499.99	NULL
Edit Copy Delete	438	XPS 13" Laptop	1499.00	NULL

This is more efficient than the initial optimisation, we can see this in how quickly it took to execute the query.

- Initial optimisation: 0.002 seconds
- further optimisation: 0.0015 seconds

These might not seem like alot but when working with large datasets, and making lots of queries, it can all add up.