The strategy for supervisions and exam questions is just to dump as much raw knowledge in the question as you possibly can. Throw anything that is every slightly related to the question that is being asked into it. This is how you demonstrate not just that you know the topic well but that you **know everything** about a topic.

Document oriented databases:

- Are keyed.
- The keys are used to look for the address of the document in a hash table.
- The keys must be stored in a separate data structure.
- There can be multiple keys each of which point to the lookup in the hash table. IE in a "Elastic Search" you could search with any of 4 or 5 keys.
- The document itself contains attributes. Each document may not contain every attribute and attributes can be multivalued.
- This is in some ways like a Java Object – if you have the name of it then you can access it in O(1) time. It has attributes, it has links to other classes – but any one instance of an object does not have to have every possible attribute initialised.
- Are **awful** when appending documents.
  Because you have to search through every other document to add the data in.
- Use two-way keys (ie if a movies document references an actor, then both the actor and the movie will have the key to the other).
- Document oriented databases are **very** fast to access for most common queries. This is because all you do is look up an address in a hash table.
- Document oriented databases are usually okay (not as bad as relational databases) for transitive queries. This is because nodes point to other nodes so you have the same sort of graph-relations that graph oriented databases have. However, if you don't have the key then you have to look through the entire document oriented database - which is just unfeasible (since NoSQL databases and especially document oriented databases just store huge amounts of data).

OLAP:

- **THIS IS ABOUT A USE NOT A SPECIFIC IMPLEMENTATION.**
- These are what you think of as normal relational databases. They, however are not "normalised". They are databases which are optimised for large amounts of quick queries, concurrency and ACID transactions.
- They do **almost no** reads which require multiple records.
- etc. This is AN APPLICATION NOT AN IMPLEMENTATION

OLTP:

- These databases are just huge – so large that you cannot do any foreign keys etc. When you perform a query on them all you can do is just parse through the database and touch each record once and only once.
- You essentially merge a ton of records together, remove all foreign keys and merge the tables in. This mega-record is known as a fact and OLTP databases are known as "fact tables".

- This is basically used for business analytics.

The notes said two things which I disagree with:

If $\lim_{x \to x_0} f(x) = F$
and $\lim_{x \to x_0} g(x) = G$
then

$$\lim_{x \to x_0} f(x) + g(x) = F + G \tag{1}$$

and

$$\lim_{x \to x_0} f(x)g(x) = FG \tag{2}$$

However: this ignores edge cases. Take the example where:

$$\begin{aligned} f(x) &= \frac{1}{x^2} \\ \therefore \lim_{x \to 0} f(x) &= \infty \end{aligned} \tag{3}$$

and

$$\begin{aligned} g(x) &= -e^{\frac{1}{x}} \\ \therefore \lim_{x \to 0} g(x) &= -\infty \end{aligned} \tag{4}$$

So the answer should be $\infty - \infty$. This is undefined.
But the limit is defined: it is $-\infty$.

There could also be the case where:

$$\begin{aligned} f(x) &= e^{\frac{1}{x}} \\ \therefore \lim_{x \to 0} f(x) &= \infty \end{aligned} \tag{5}$$

and

$$\begin{aligned} g(x) &= -\frac{1}{x^2} \\ \therefore \lim_{x \to 0} g(x) &= -\infty \end{aligned} \tag{6}$$

So the limit should be $\infty - \infty$...
But $\lim_{x \to 0} = \infty$.
This is different to the previous limit.

Consider also the second case:

$$\begin{aligned} f(x) &= x \\ \therefore \lim_{x \to \infty} f(x) &= \infty \end{aligned} \tag{7}$$

and

$$\begin{aligned} g(x) &= e^{-x} \\ \therefore \lim_{x \to \infty} g(x) &= 0 \end{aligned} \tag{8}$$

So the answer should be $0 \times \infty$. This is undefined.
But the limit is defined and is 0.

However there could also be the case where:

$$\begin{aligned} f(x) &= e^{x} \\ \therefore \lim_{x \to \infty} f(x) &= \infty \end{aligned} \tag{9}$$

and

$$\begin{aligned} g(x) &= \frac{1}{x} \\ \therefore \lim_{x\to\infty} g(x) &= 0 \end{aligned} \tag{10}$$

We again have the situation where two functions with the same limits have different limits when combined. This again contradicts the statement.

To make it correct: both F and G must be defined and non-∞.