Backup, Law, Ethics

This week:

- Backing up:
  - MySQL
  - SQL Server
- Law
- Ethics

Backup – SQL Server

All DataBase Management Systems, (DBMSs) offers backup options

Backup is essential to keep data safe in case of:

- Physical damage to **location**
- Physical damage to **server**
- **Disk failure**
- Unintentional **hack** that changes / remove data
- *and* many other dangers that you can think of and some you can't

What Is *and* Isn't Backup?

- It is:

  "The process of periodically copying of the database and log file (and possibly programs) to offline storage media"

  Connolly and Begg, p.526

- It isn't:

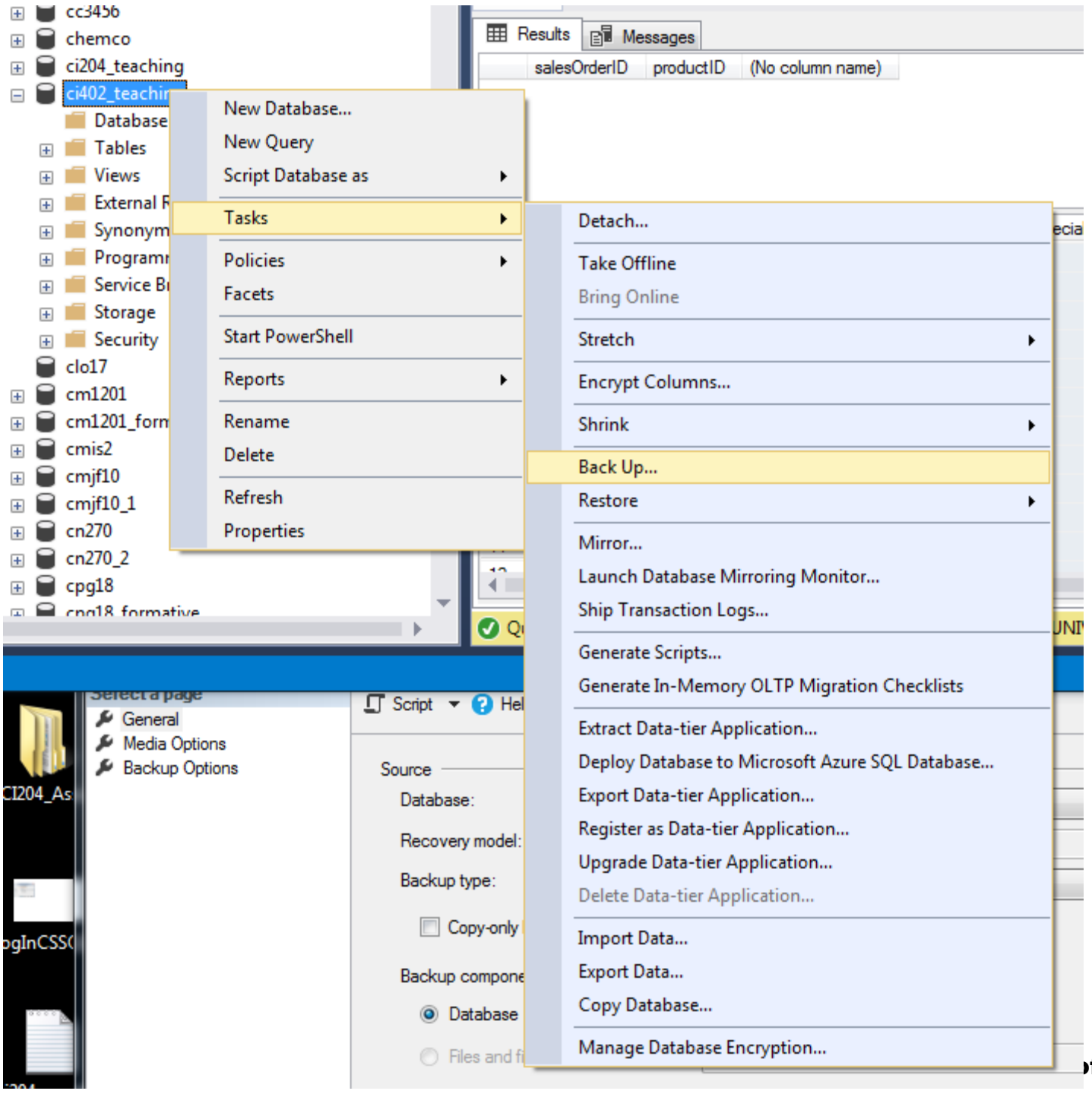
  "It's not a backup file unless you have tested that you can restore it – it's a just a file that lives somewhere else"

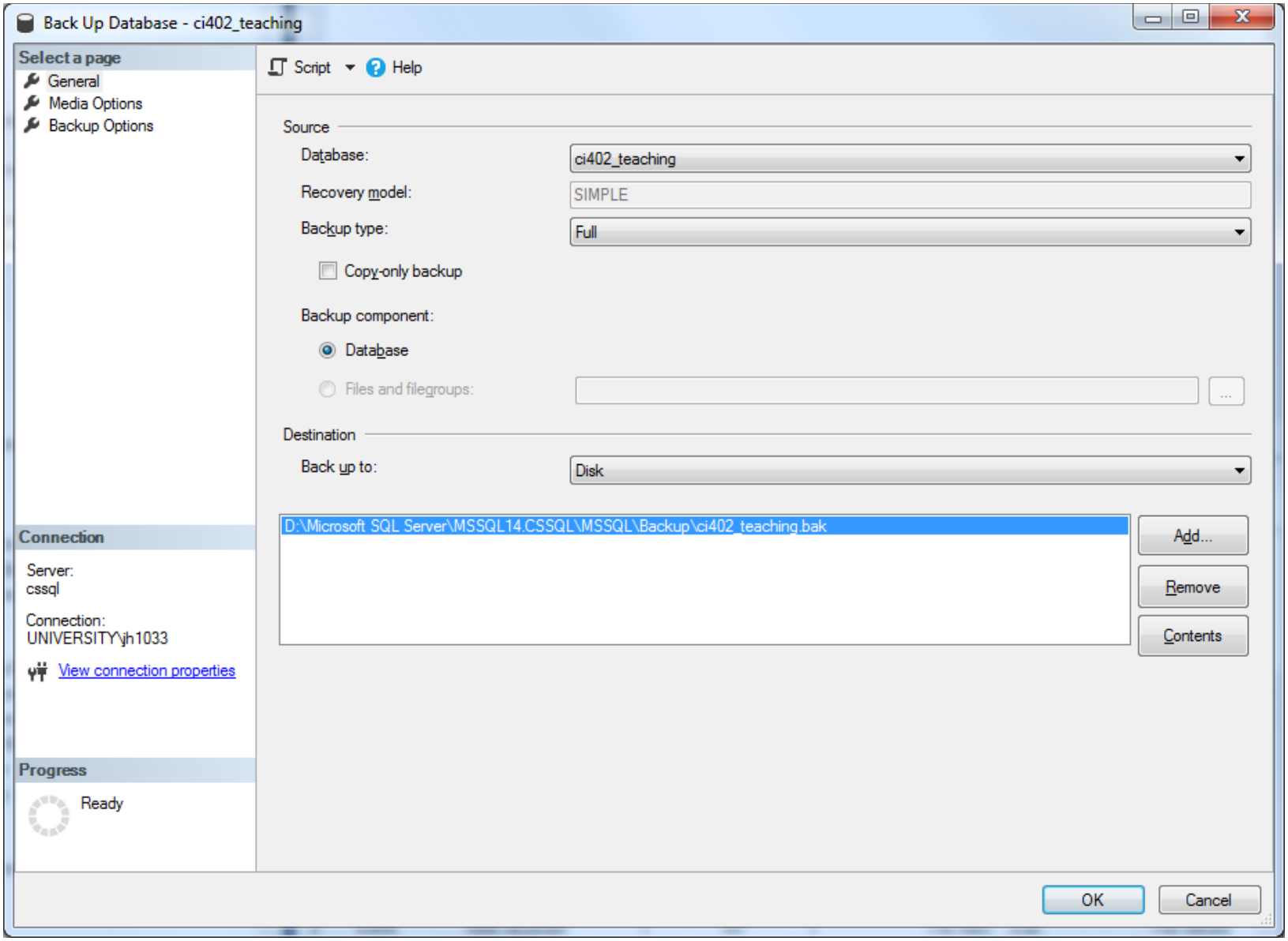
  Former colleague of Jennie's

How To Backup – SQL Server

- Right click on your database – select *Tasks->Backup*
- You can backup to:
  - URL
  - Disk
  - Other archive e.g. tape etc.

- Displays *Back Up Database* dialogue


cc3456
chemco
ci204_teaching
ci402_teachin
Database
Tables
Views
External R
Synonym
Programm
Service Br
Storage
Security
clo17
cm1201
cm1201_form
cmis2
cmjf10
cmjf10_1
cn270
cn270_2
cpg18
cpg18_formative
Results
Messages
salesOrderID
productID
(No column name)
New Database...
New Query
Script Database as
Tasks
Policies
Facets
Start PowerShell
Reports
Rename
Delete
Refresh
Properties
Detach...
Take Offline
Bring Online
Stretch
Encrypt Columns...
Shrink
Back Up...
Restore
Mirror...
Launch Database Mirroring Monitor...
Ship Transaction Logs...
Generate Scripts...
Generate In-Memory OLTP Migration Checklists
Extract Data-tier Application...
Deploy Database to Microsoft Azure SQL Database...
Export Data-tier Application...
Register as Data-tier Application...
Upgrade Data-tier Application...
Delete Data-tier Application...
Import Data...
Export Data...
Copy Database...
Manage Database Encryption...
Select a page
General
Media Options
Backup Options
Script
Source
Database:
Recovery model:
Backup type:
Copy-only
Backup compone
Database

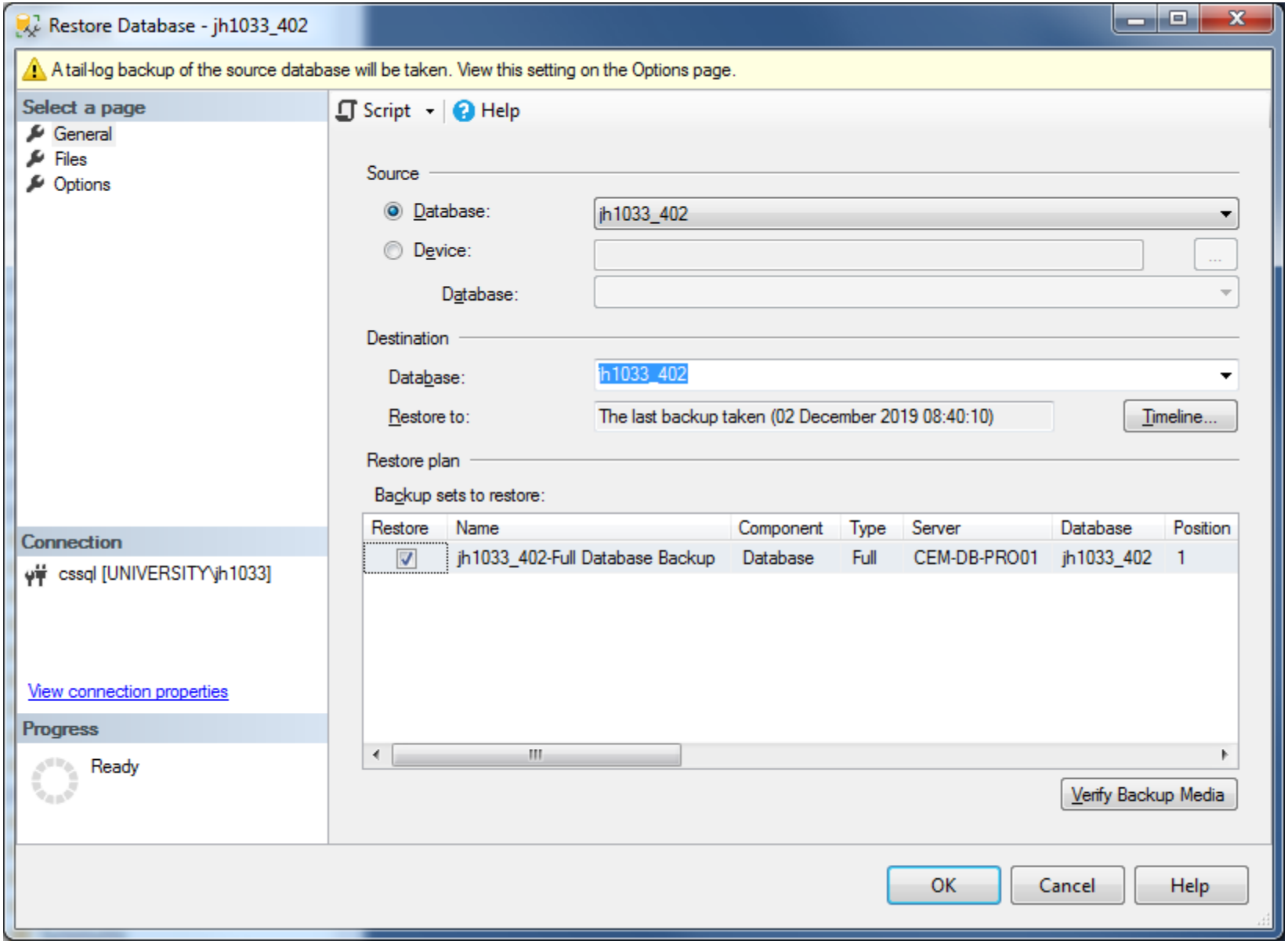

Back Up Database - ci402_teaching
Select a page
General
Media Options
Backup Options
Script
Help
Source
Database:
ci402_teaching
Recovery model:
SIMPLE
Backup type:
Full
Copy-only backup
Backup component:
Database
Files and filegroups:
Destination
Back up to:
Disk
D:\Microsoft SQL Server\MSSQL14.CSSQL\MSSQL\Backup\ci402_teaching.bak
Add...
Remove
Contents
Connection
Server:
cssql
Connection:
UNIVERSITY\jh1033
View connection properties
Progress
Ready
OK
Cancel

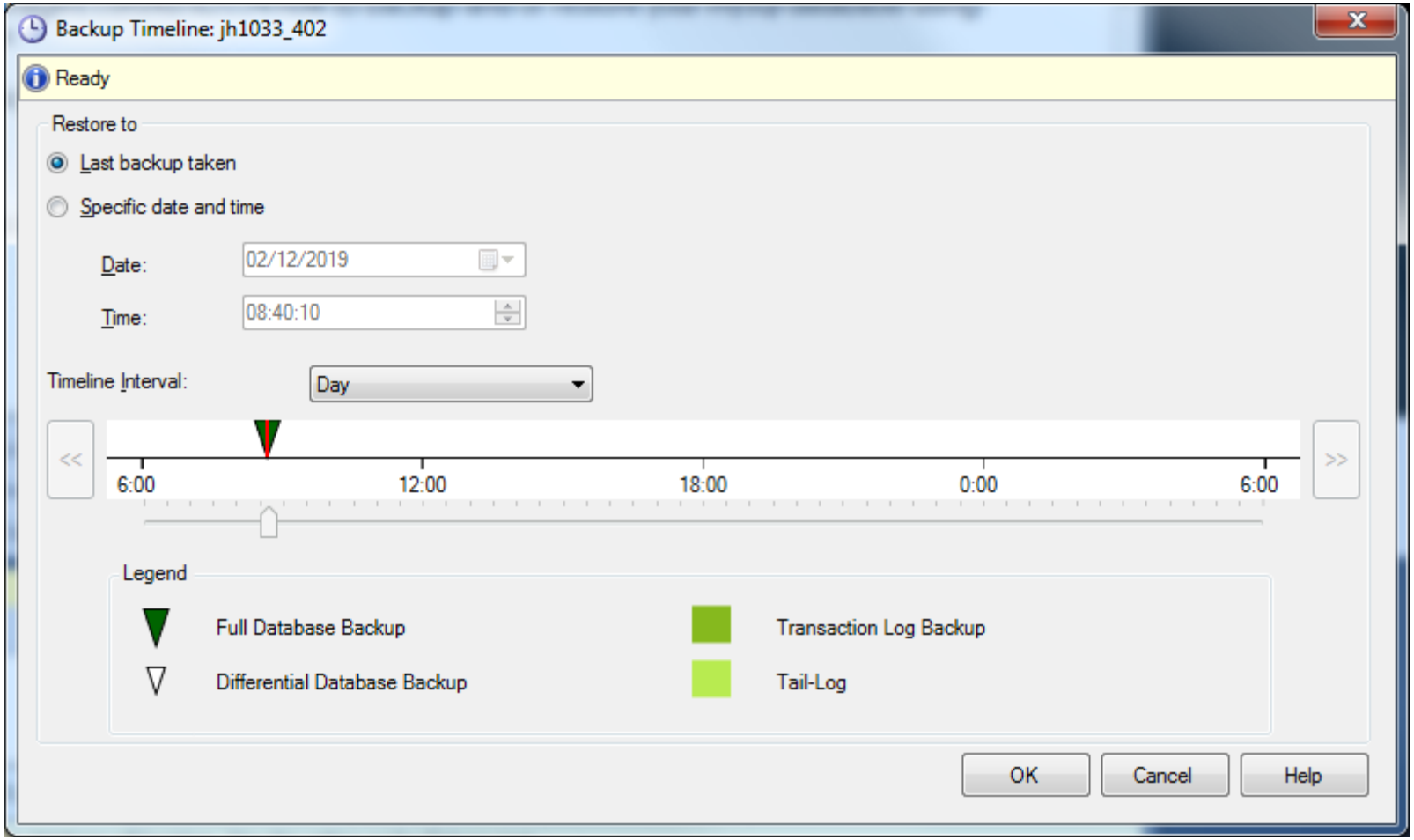
How To Backup – SQL Server

- I have chosen a *full* backup (everything)
- Can't change path (it's the Database Administrator that sets this – why?)
- You may not be able to do this (permissions), so pictures here
- Creates **.bak* file – generic backup file extension, could be created by many programs, no ONE program can open them all

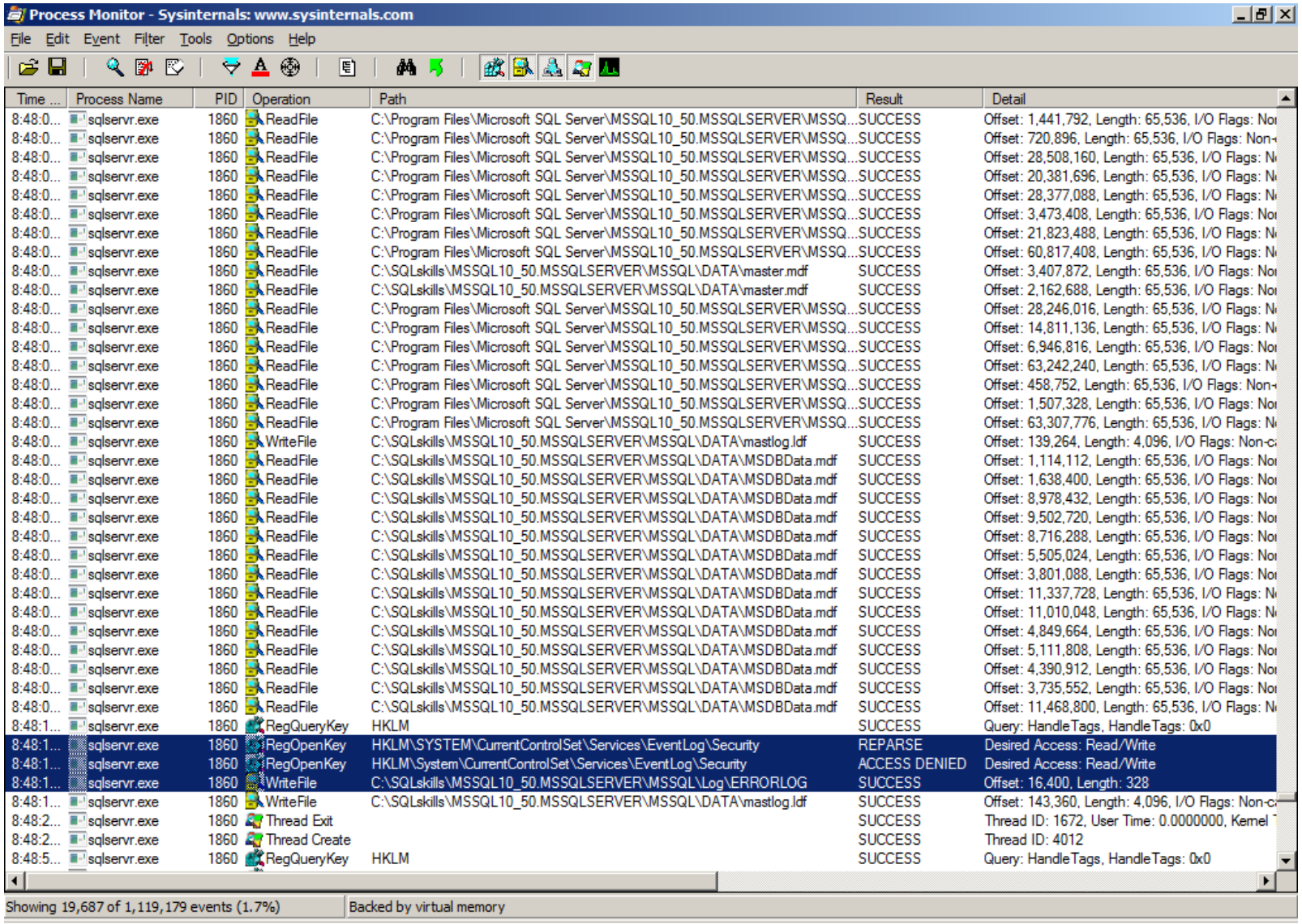
How To Restore – SQL Server

- Right click on database, select
  Tasks->Restore
- Can click on *Timeline* button to see history of backups

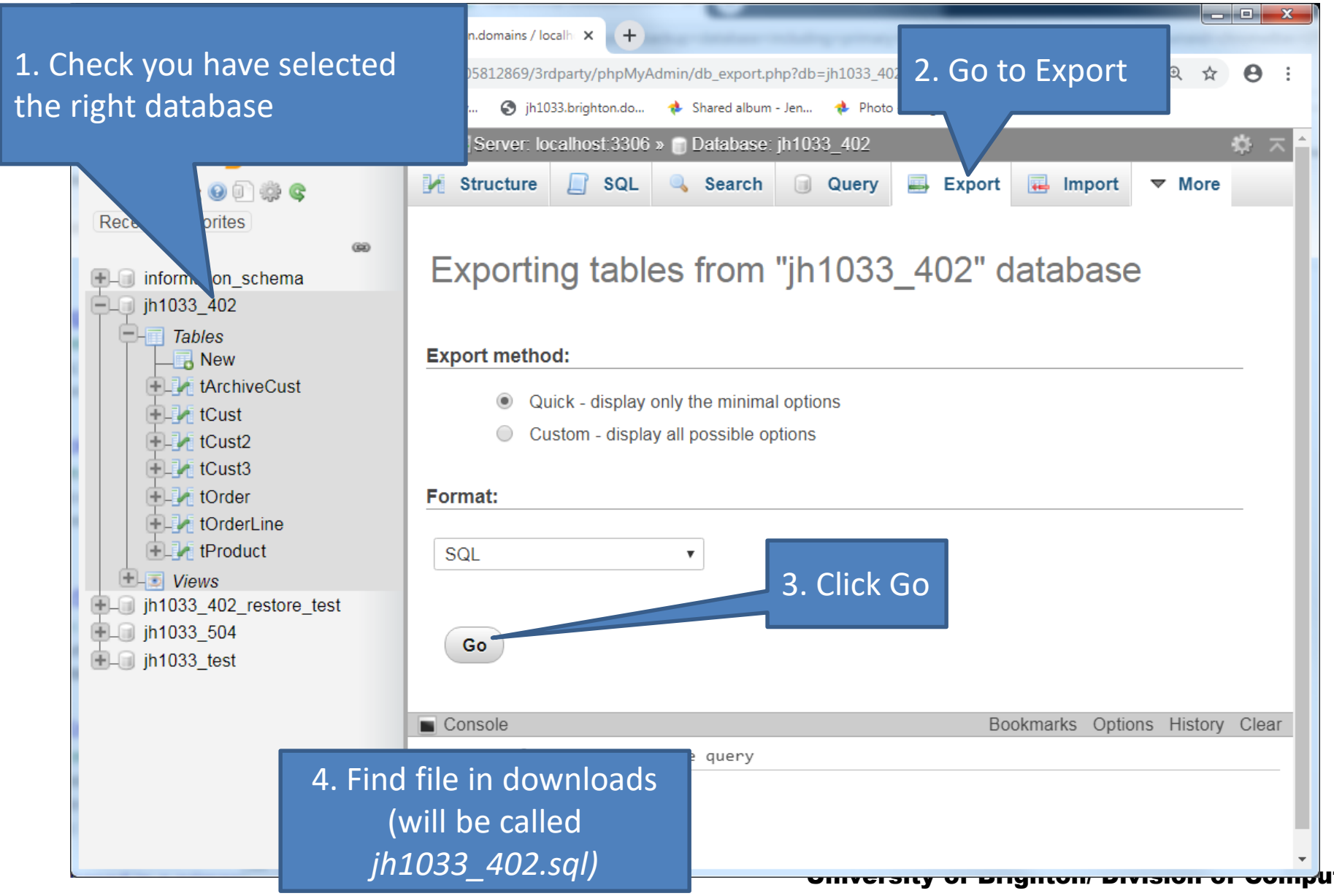

Restore Database - jh1033_402
A tail-log backup of the source database will be taken. View this setting on the Options page.
Select a page
General
Files
Options
Script
Help
Source
Database:
jh1033_402
Device:
Database:
Destination
Database:
jh1033_402
Restore to:
The last backup taken (02 December 2019 08:40:10)
Timeline...
Restore plan
Backup sets to restore:
Restore
Name
Component
Type
Server
Database
Position
jh1033_402-Full Database Backup
Database
Full
CEM-DB-PRO01
jh1033_402
1
Verify Backup Media
Connection
cssql [UNIVERSITY\jh1033]
View connection properties
Progress
Ready
OK
Cancel
Help


Backup Timeline: jh1033_402
Ready
Restore to
Last backup taken
Specific date and time
Date:
02/12/2019
Time:
08:40:10
Timeline Interval:
Day
<<
>>
6:00
12:00
18:00
0:00
6:00
Legend
Full Database Backup
Differential Database Backup
Transaction Log Backup
Tail-Log
OK
Cancel
Help

Backup Log File Example



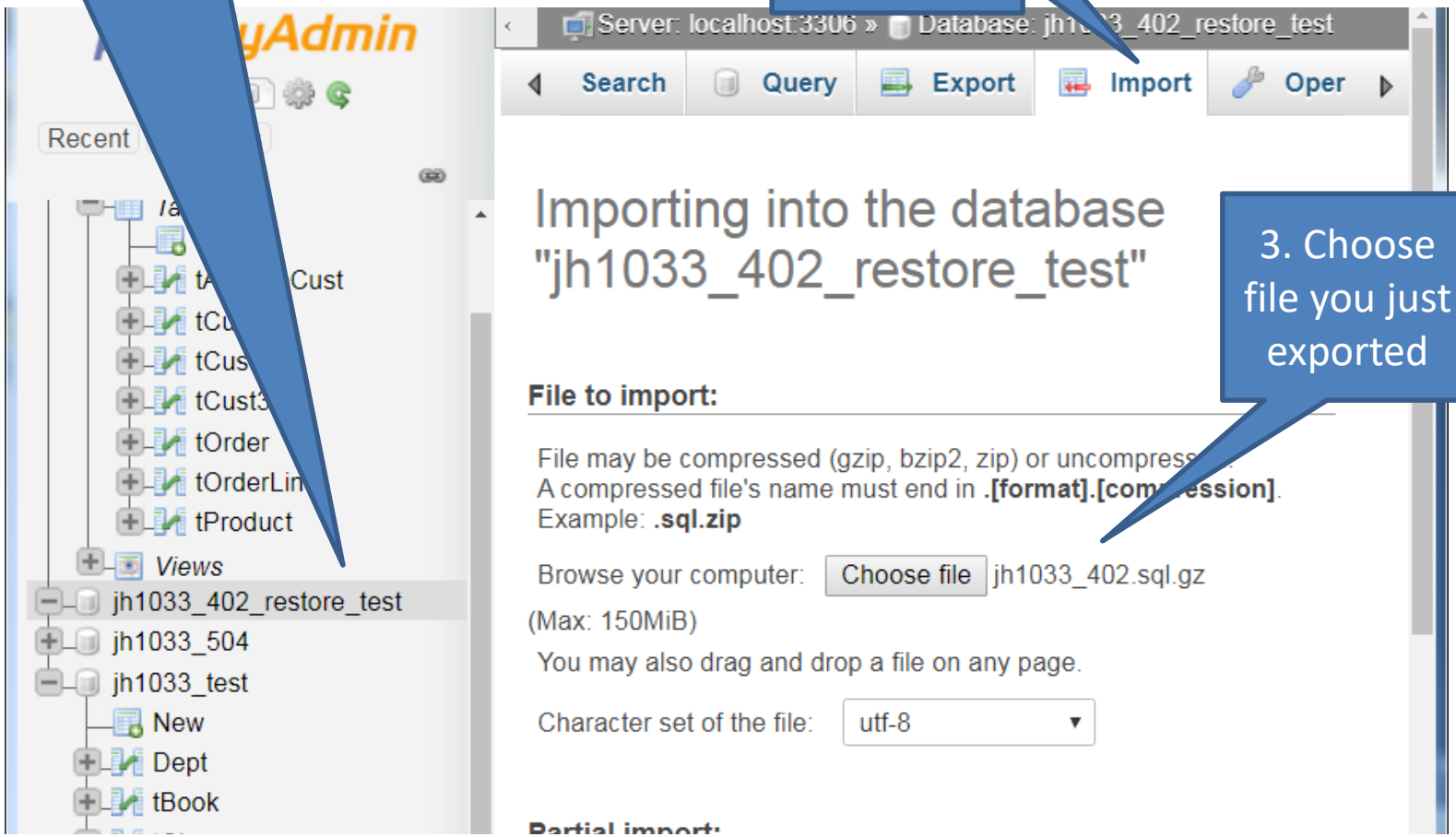
MySQL – Backup - Simple



MySQL – Simple - Restore

1. Create empty (new) db (mine's called jh1033_402_restore_test)

2. Select Import

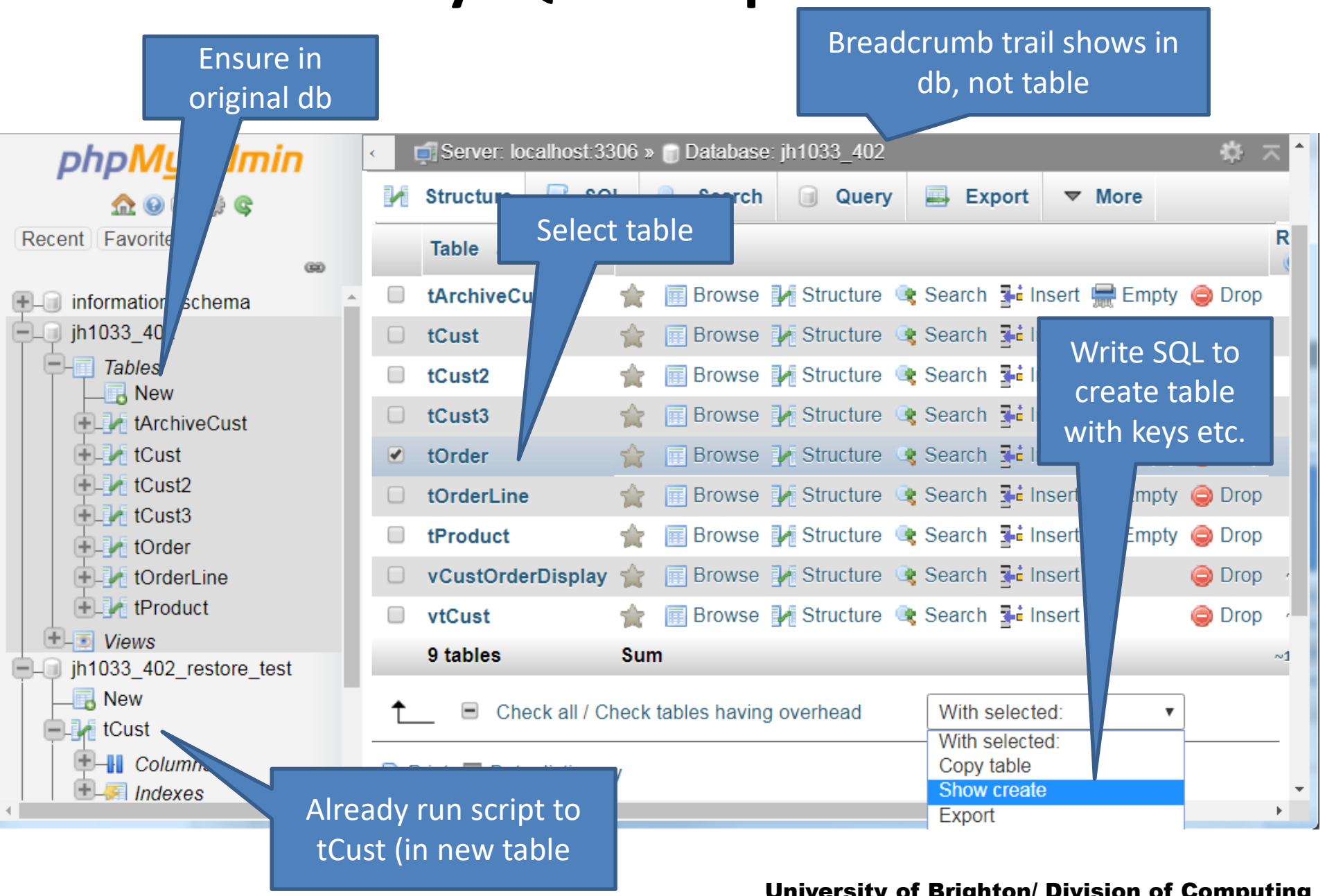


3. Choose file you just exported

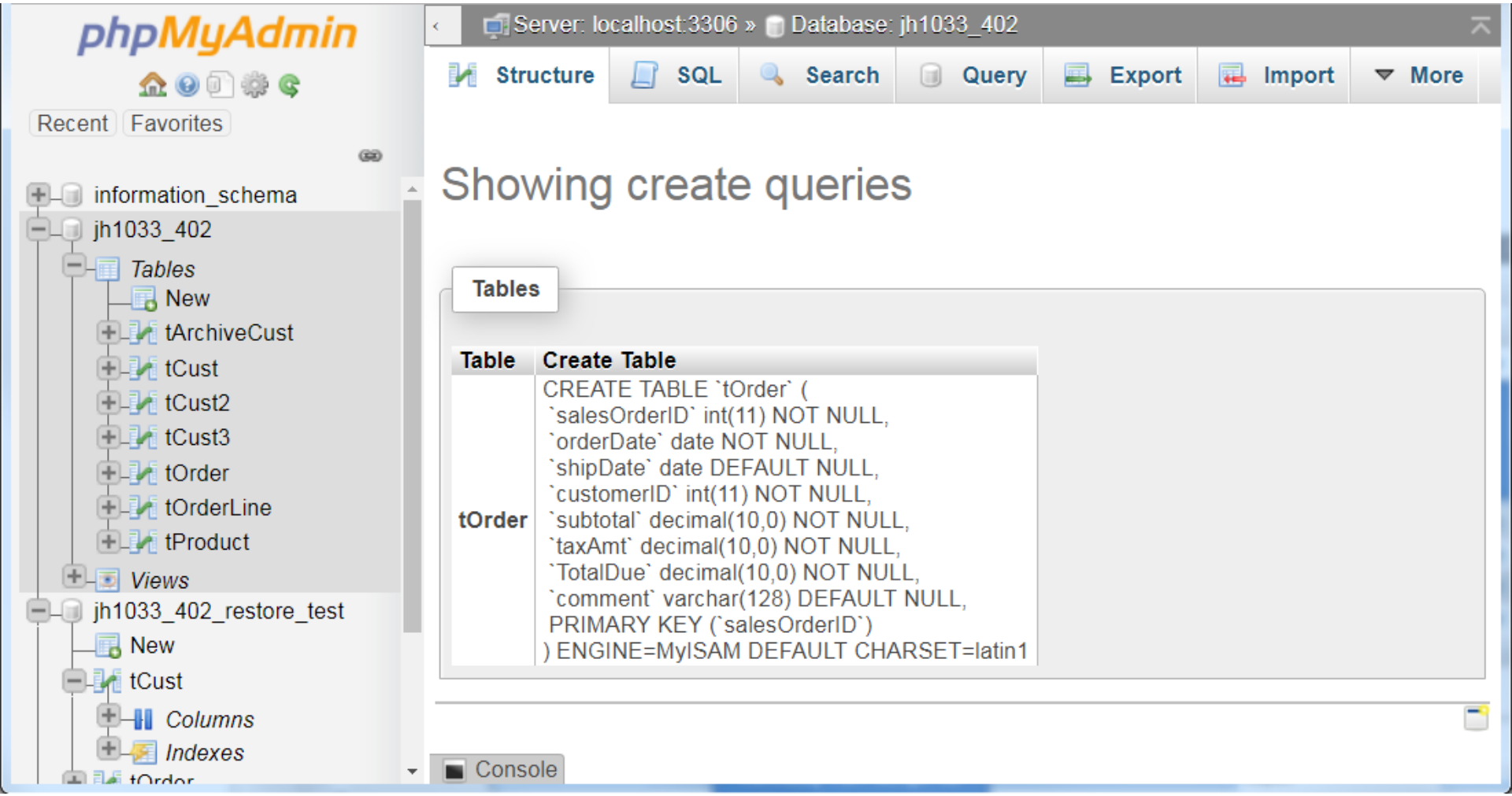
MySQL – Simple - Issues

- Will back up *data* and *structure* (tables) – fine to restore to existing db
- Won't include *primary keys, constraints* etc. (only includes *data, field* and *table names* etc.)
- To do this, first export table structure (not data), then run SQL to create table in new db
- Then export data itself e.g. to CSV format
- Then import data to new tables (see week 1 for more info – it's how you set up original db)

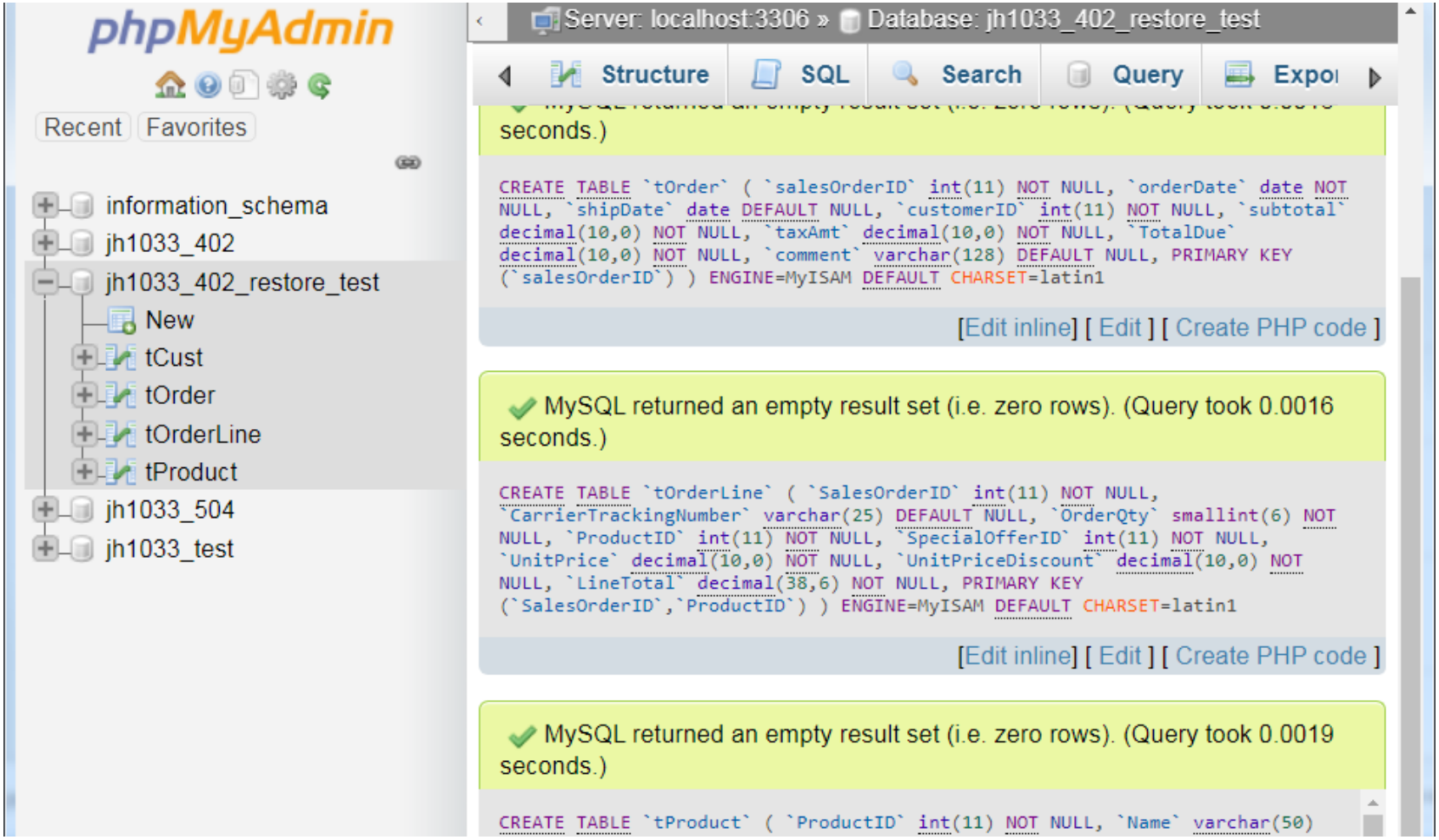
MySQL – Script Table



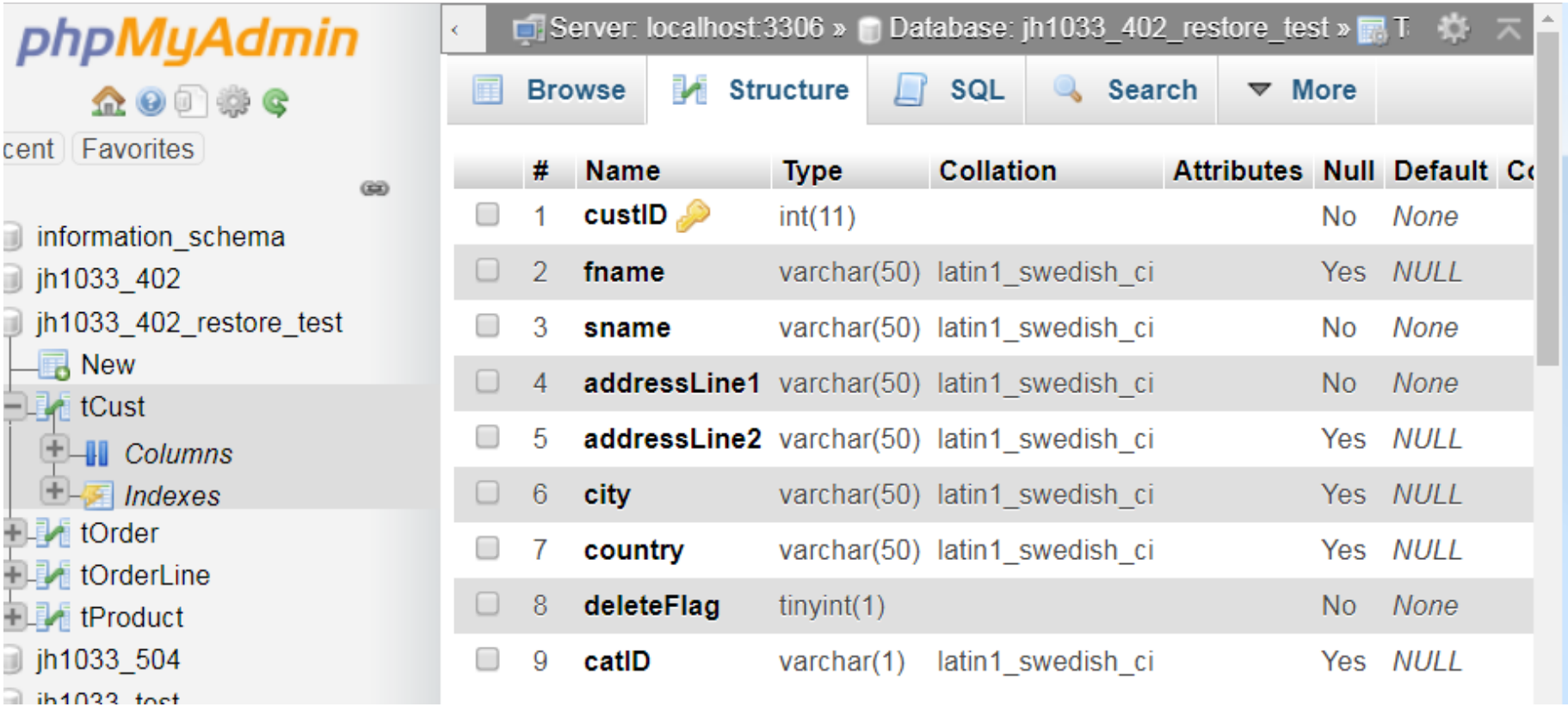
MySQL – Script Table – Copy and Run in New db to Create Empty Table (Next Slide)



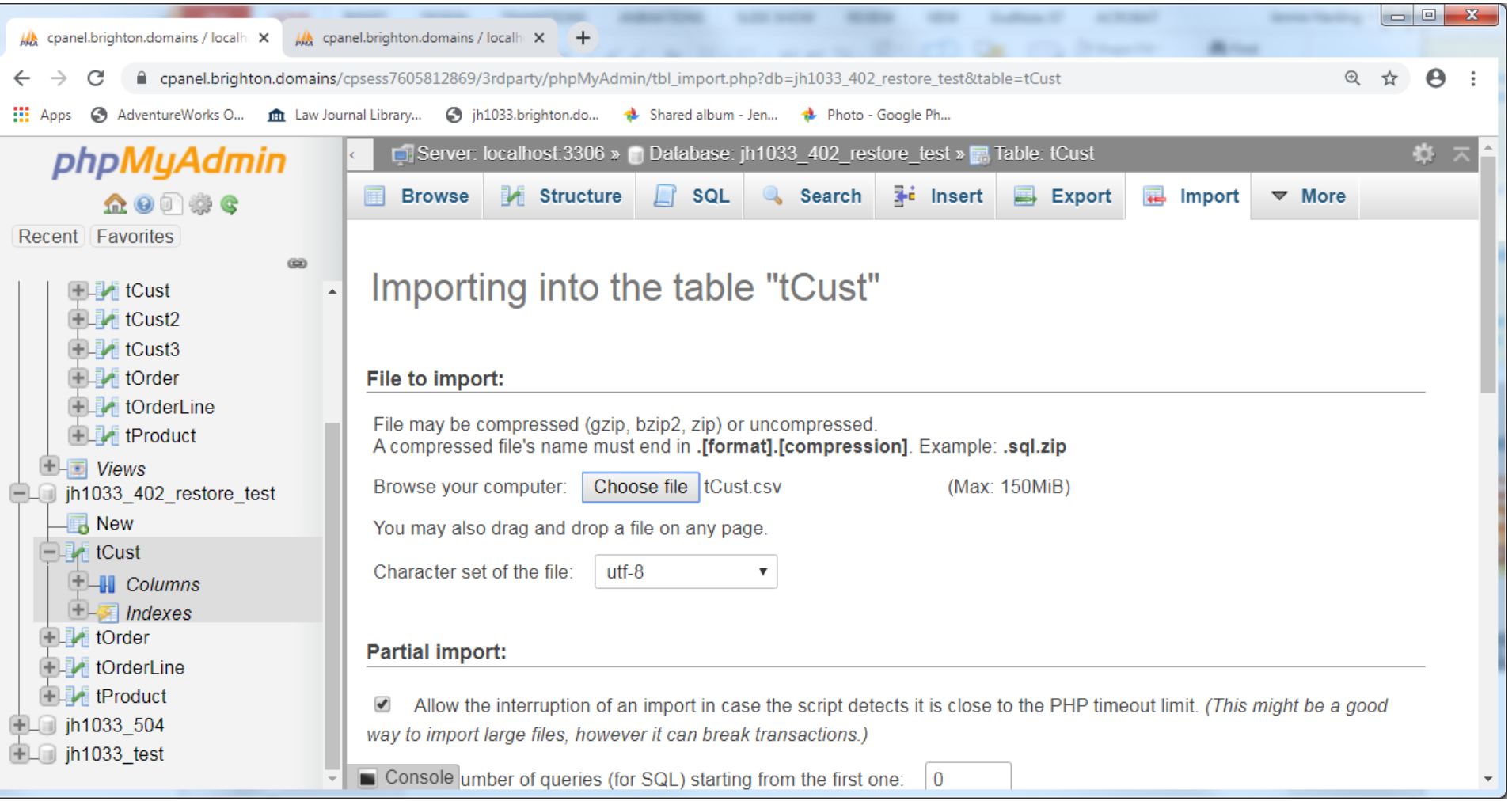
MySQL – Create Tables



MySQL – New Table with PK



MySQL – Populate Table With Import (see week one)



Types of Backup

3 Main Types:

- *Full* – whole database, structure and tables
- *Incremental* or *Differential* – incremental copies data changed since last backup (not standalone) – differential is cumulative
- *Transactional Logs* – files showing all transactions (example on next slide)

- For more information on SQL Server backup (and some in general): https://docs.microsoft.com/en-us/sql/t-sql/statements/backup-transact-sql?view=sql-server-2017
- For more information on MySQL backup: https://dev.mysql.com/doc/mysql-backup-excerpt/5.7/en/backup-and-recovery.html

Backup Schedule

How often you do it depends on how often the db changes, how at risk it is, etc. etc.

But different types of backup need to done in certain order – e.g.

- ***Sunday Midnight*** -- Do a *full* database backup.
- ***Every day at midnight*** -- Do a *differential* or *incremental* database backup.
- ***Every 15 minutes*** -- Do a *transaction log* backup

Backup Schedule

So, Wednesday lunchtime – database fails!!!

Restore:

- Previous Sundays FULL BACKUP
- Restore Monday and Tuesday's INCREMENTAL BACKUP *or* Tuesday's DIFFERENTIAL BACKUP
- Restore any TRANSACTIONAL LOGS

Can all be done automatically by SQL Server and with scripts / addons / extensions for MySQL

Legal Issues

Personal Data covered by:

- **Data Protection Act 2018** (DPA) *is the*
- UK implementation of the EU **General Data Protection Regulation 2016**
- https://www.gov.uk/data-protection

Legal Issues - DPA – Personal Data

Personal Data is:

*"'…any information relating to an identified or *identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a **name**, an **identification number**, location data, an online identifier or to one or more factors specific to the **physical**, **physiological**, **genetic**, **mental**, **economic**, **cultural** or **social identity** of that natural person"*

*identifiable means either *directly* or *indirectly*

Source: ICO, 2019, *What is personal data,* [online] available at: https://ico.org.uk/for-organisations/guide-to-data-protection/guide-to-the-general-data-protection-regulation-gdpr/what-is-personal-data/what-is-personal-data/ [accessed Dec 2019]

Legal Issues – DPA – Sensitive Data

Additionally , some data is *sensitive,* with extra protection, about an individual's:

- race;
- ethnic origin;
- political opinions;
- religious or philosophical beliefs;
- trade union membership;
- genetic data;
- biometric data (where this is used for identification purposes);
- health data;
- sex life; or
- sexual orientation
- criminal convictions / offenses

Legal Issues – DPA – Data Subject Rights

- be informed about how your data is being used
- access personal data
- have incorrect data updated
- have data erased
- stop or restrict the processing of your data
- data portability (allowing you to get and reuse your data for different services)
- object to how your data is processed in certain circumstances

You also have rights when an organisation is using your personal data for:

- automated decision-making processes (without human involvement)
- profiling, for example to predict your behaviour or interests

Data Ethics

- Growing field
- More than sticking to law
- Likely to grow due to *AI /Big Data* etc.
- Start point: Look at one of these case studies: https://aiethics.princeton.edu/case-studies/case-study-pdfs/