

MySQL

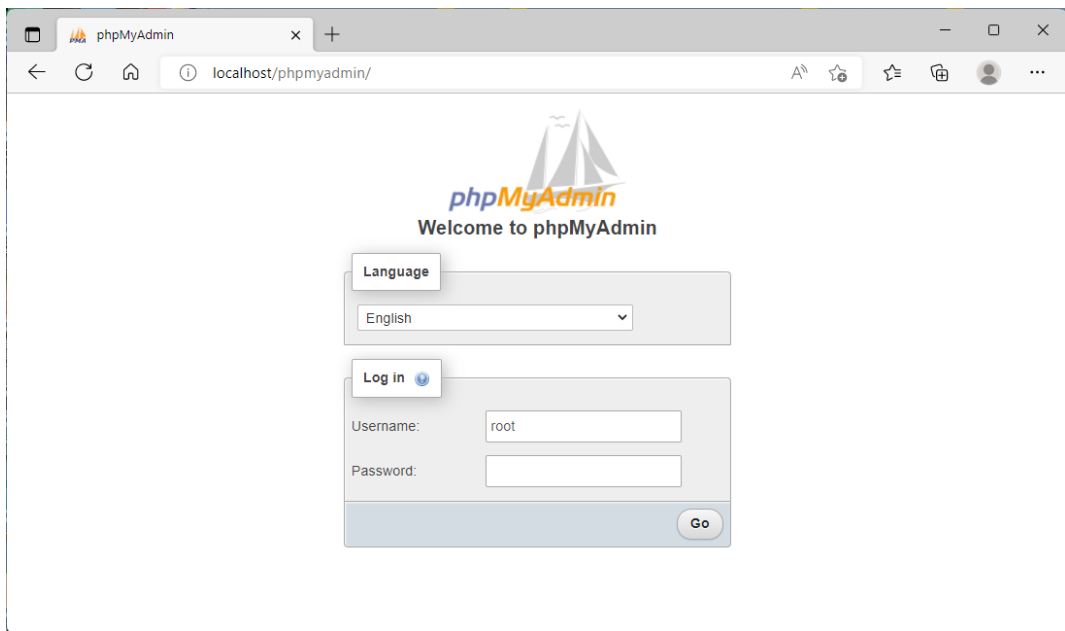
# MySQL

- MySQL je sistem za upravljanje relacionom bazom podataka
- Multiplatformski je (Linux/Windows)
- Besplatan je
- Jedan od najrasprostranjenijih sistema za upravljanje relacionim bazama podataka



# PhpMyAdmin

- PhpMyAdmin je php web aplikacija za upravljanje MySql serverom
- Široko je rasprostranjena
- Nalazi se i u okviru xamp(wamp) paketa



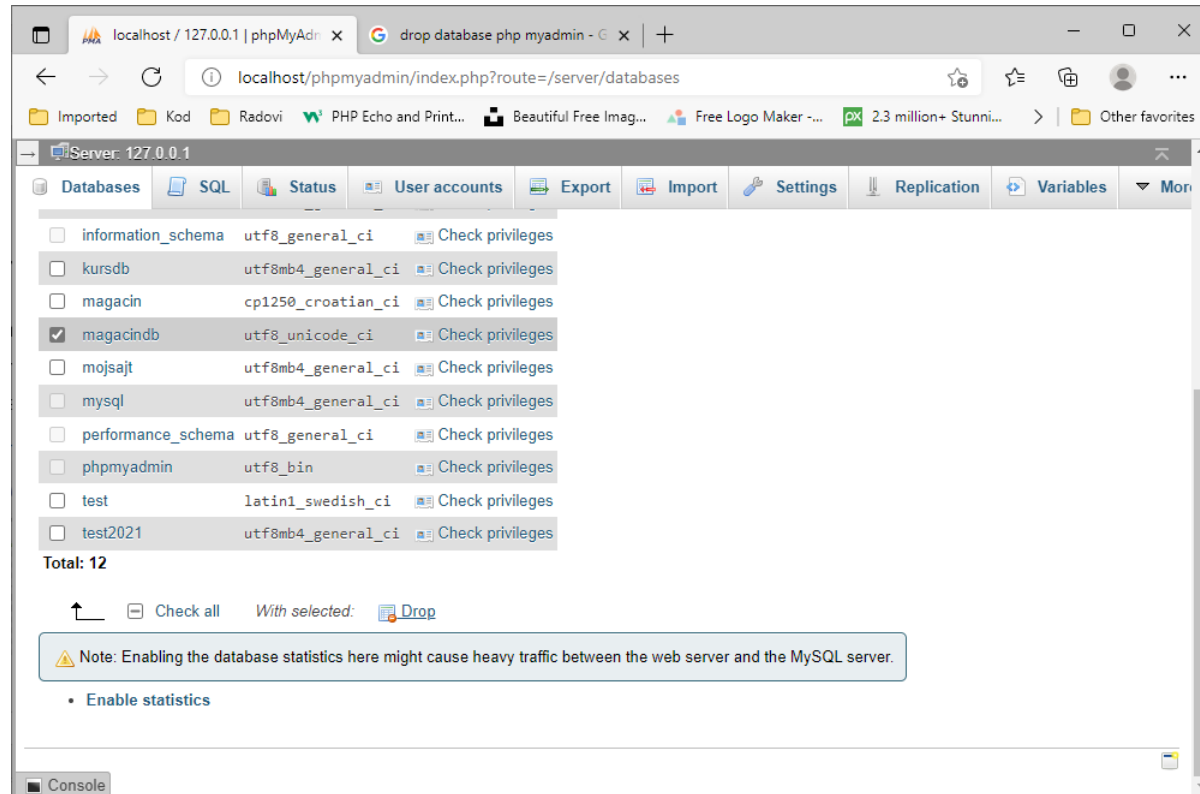
# PhpMyAdmin

The screenshot displays the PhpMyAdmin web interface in a browser window. The address bar shows the URL `localhost/phpmyadmin/`. The interface includes a navigation menu on the left with options like "New", "blogdb", "information\_schema", "magacin", "kategorija", "proizvod", "mysql", "performance\_schema", "phpmyadmin", and "test". The main content area is divided into several panels:

- General settings:** Shows "Server connection collation" set to `utf8mb4_unicode_ci` with a "More settings" link.
- Appearance settings:** Shows "Language" set to "English" and "Theme" set to "pmahomme".
- Database server:** Lists server details:
  - Server: 127.0.0.1 via TCP/IP
  - Server type: MariaDB
  - Server connection: SSL is not being used
  - Server version: 10.4.18-MariaDB - mariadb.org binary distribution
  - Protocol version: 10
  - User: root@localhost
  - Server charset: UTF-8 Unicode (utf8mb4)
- Web server:** Lists web server details:
  - Apache/2.4.46 (Win64) OpenSSL/1.1.1j

A "Console" tab is visible at the bottom left of the interface.

# Brisanje baze podataka



The screenshot shows the phpMyAdmin interface for a MySQL server at localhost:127.0.0.1. The 'Databases' tab is active, displaying a list of databases with their character sets and collations. The 'magacindb' database is selected. Below the list, there are controls for 'Check all' and 'Drop' (highlighted in blue). A note indicates that enabling database statistics might cause heavy traffic. A 'Console' tab is visible at the bottom.

| Database                                      | Character Set      | Collation | Check privileges                 |
|---|--------------------|-----------|----------------------------------|
| <input type="checkbox"/> information_schema   | utf8_general_ci    |           | <a href="#">Check privileges</a> |
| <input type="checkbox"/> kursdb               | utf8mb4_general_ci |           | <a href="#">Check privileges</a> |
| <input type="checkbox"/> magacin              | cp1250_croatian_ci |           | <a href="#">Check privileges</a> |
| <input checked="" type="checkbox"/> magacindb | utf8_unicode_ci    |           | <a href="#">Check privileges</a> |
| <input type="checkbox"/> mojsajt              | utf8mb4_general_ci |           | <a href="#">Check privileges</a> |
| <input type="checkbox"/> mysql                | utf8mb4_general_ci |           | <a href="#">Check privileges</a> |
| <input type="checkbox"/> performance_schema   | utf8_general_ci    |           | <a href="#">Check privileges</a> |
| <input type="checkbox"/> phpmyadmin           | utf8_bin           |           | <a href="#">Check privileges</a> |
| <input type="checkbox"/> test                 | latin1_swedish_ci  |           | <a href="#">Check privileges</a> |
| <input type="checkbox"/> test2021             | utf8mb4_general_ci |           | <a href="#">Check privileges</a> |

Total: 12

↑ Check all With selected: [Drop](#)

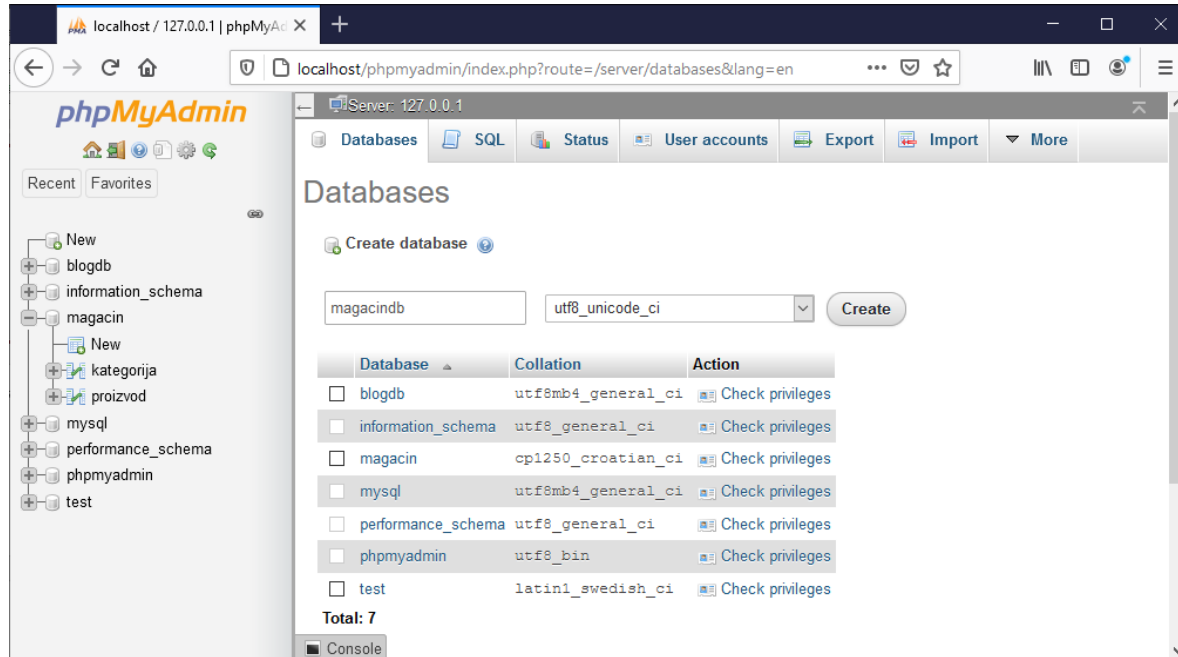
⚠ Note: Enabling the database statistics here might cause heavy traffic between the web server and the MySQL server.

- [Enable statistics](#)

Console

Dugme Drop

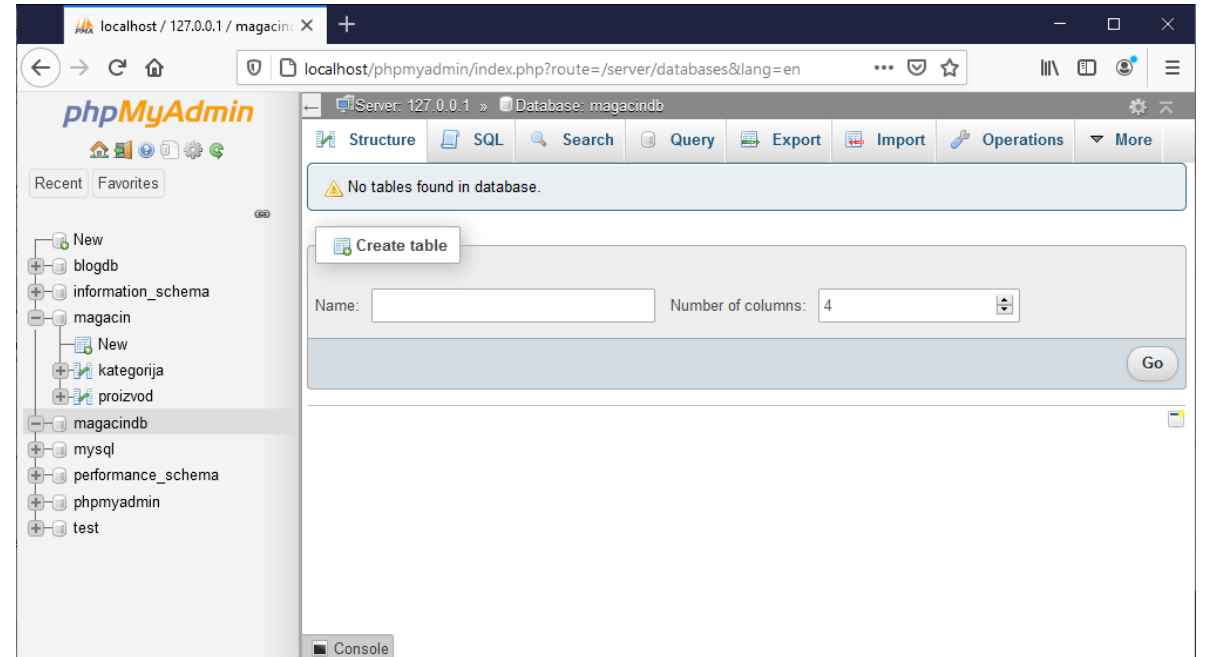
# Kreiranje baze podataka



The screenshot shows the phpMyAdmin interface at localhost/127.0.0.1. The 'Databases' section is active, displaying a list of existing databases. A 'Create database' form is visible at the top, with 'magacindb' entered in the name field and 'utf8\_unicode\_ci' selected for the collation. A 'Create' button is next to the form.

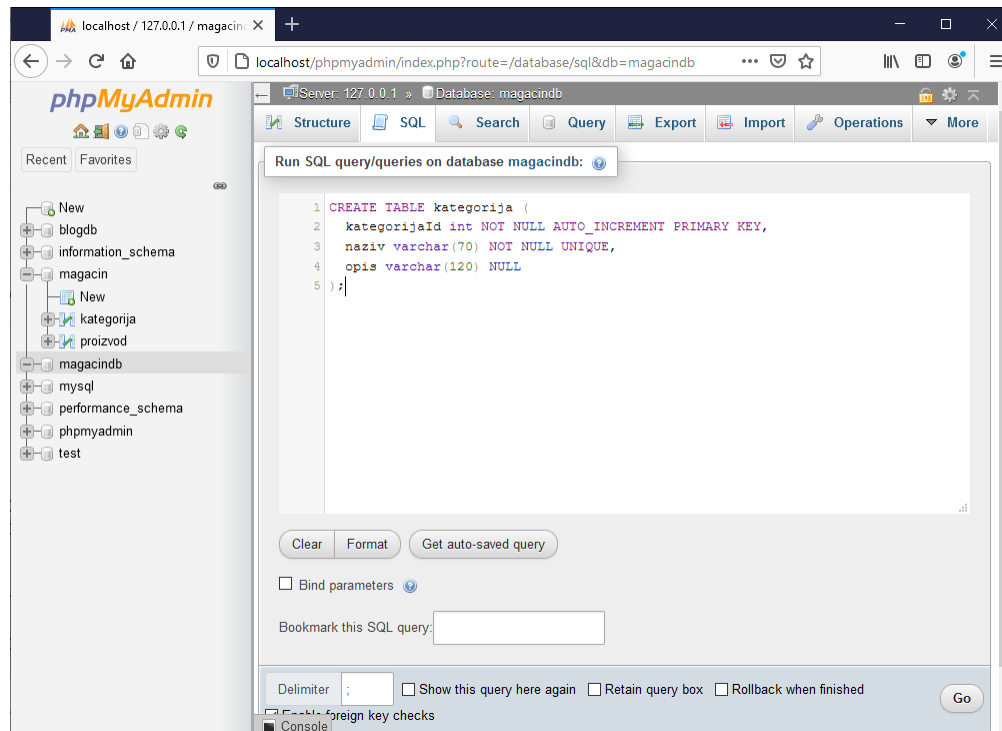
| Database                                    | Collation          | Action                           |
|---|--------------------|----------------------------------|
| <input type="checkbox"/> blogdb             | utf8mb4_general_ci | <a href="#">Check privileges</a> |
| <input type="checkbox"/> information_schema | utf8_general_ci    | <a href="#">Check privileges</a> |
| <input type="checkbox"/> magacin            | cp1250_croatian_ci | <a href="#">Check privileges</a> |
| <input type="checkbox"/> mysql              | utf8mb4_general_ci | <a href="#">Check privileges</a> |
| <input type="checkbox"/> performance_schema | utf8_general_ci    | <a href="#">Check privileges</a> |
| <input type="checkbox"/> phpmyadmin         | utf8_bin           | <a href="#">Check privileges</a> |
| <input type="checkbox"/> test               | latin1_swedish_ci  | <a href="#">Check privileges</a> |

Total: 7



The screenshot shows the phpMyAdmin interface at localhost/127.0.0.1, now in the 'Database: magacindb' view. A warning message states 'No tables found in database.' Below this, the 'Create table' form is active. The 'Name' field is empty, and the 'Number of columns' is set to 4. A 'Go' button is located at the bottom right of the form.

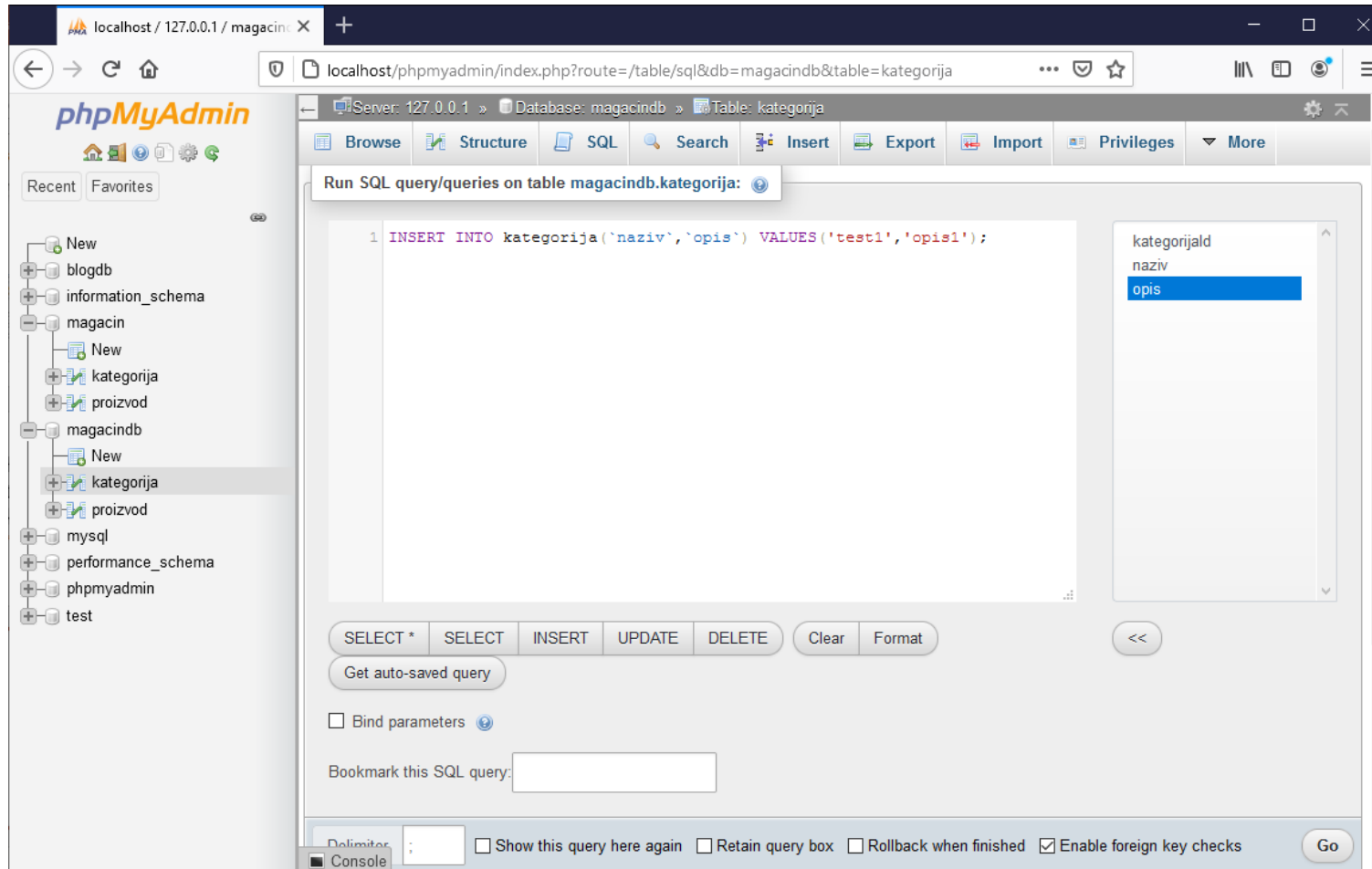
# Kreiranje tabele kategorija



CREATE TABLE kategorija(  
kategorijaId int PRIMARY KEY AUTO\_INCREMENT,  
naziv varchar(70) NOT NULL UNIQUE,  
opis varchar(120) DEFAULT NULL  
)

Dugme GO za izvršavanje upita

# Upiti nad tabelom kategorija



The screenshot shows the phpMyAdmin interface in a web browser. The browser address bar shows the URL: localhost/phpmyadmin/index.php?route=/table/sql&db=magacindb&table=kategorija. The interface displays the 'Run SQL query/queries on table magacindb.kategorija:' window. The SQL query entered is: `1 INSERT INTO kategorija (`naziv`, `opis`) VALUES ('test1', 'opis1');`. Below the query editor, there are buttons for 'SELECT \*', 'SELECT', 'INSERT', 'UPDATE', 'DELETE', 'Clear', and 'Format'. The 'INSERT' button is highlighted. Below these buttons, there is a checkbox for 'Bind parameters' and a text input field for 'Bookmark this SQL query:'. At the bottom, there are options for 'Delimitor' (set to semicolon), 'Show this query here again', 'Retain query box', 'Rollback when finished', and 'Enable foreign key checks' (checked). A 'Go' button is located at the bottom right.

Server: 127.0.0.1 » Database: magacindb » Table: kategorija

Run SQL query/queries on table magacindb.kategorija:

```
1 INSERT INTO kategorija (`naziv`, `opis`) VALUES ('test1', 'opis1');
```

SELECT \* SELECT INSERT UPDATE DELETE Clear Format

Get auto-saved query

Bind parameters

Bookmark this SQL query:

Delimitor: ;  Show this query here again  Retain query box  Rollback when finished  Enable foreign key checks Go

Console

| kategorijald |
|--------------|
| naziv        |
| opis         |



# Insert upiti

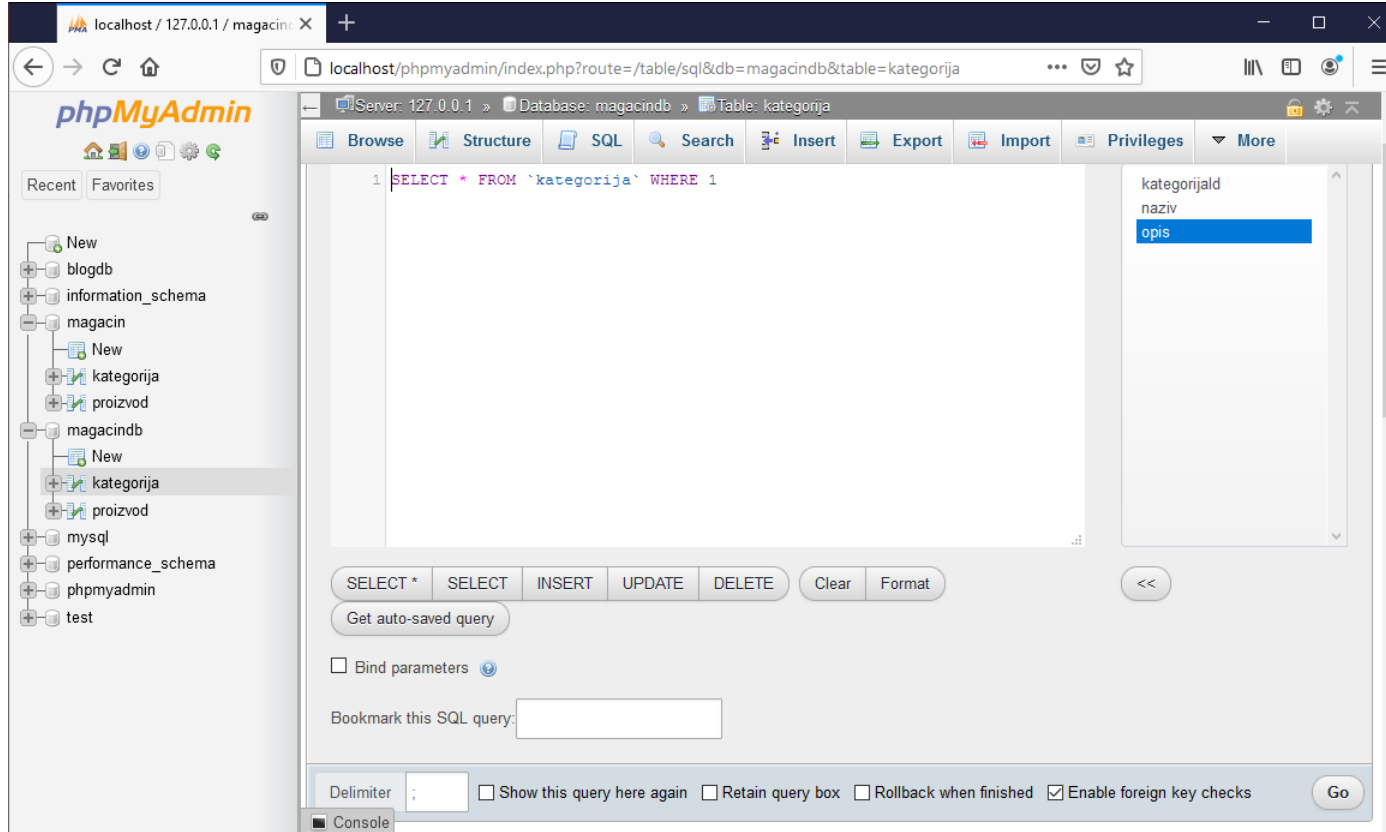
```
INSERT INTO `kategorija` (`kategorijald`, `naziv`, `opis`) VALUES  
(1, 'Pića', 'Alkoholna, bezalkoholna pića, kafe');
```

```
INSERT INTO `kategorija` VALUES  
(2, 'Mleko i mlečni proizvodi', NULL);
```

```
INSERT INTO `kategorija` VALUES  
(3, 'Slatkisi i grickalice', NULL);
```

```
INSERT INTO kategorija VALUES  
(4, 'Hleb i peciva', NULL);
```

# SELECT upit



The screenshot shows the phpMyAdmin interface for a MySQL database named 'magacindb'. The current table selected is 'kategorija'. The SQL query entered in the query editor is:

```
1 SELECT * FROM `kategorija` WHERE 1
```

The results pane on the right shows the following columns:

| kategorijald |
|--------------|
| naziv        |
| opis         |

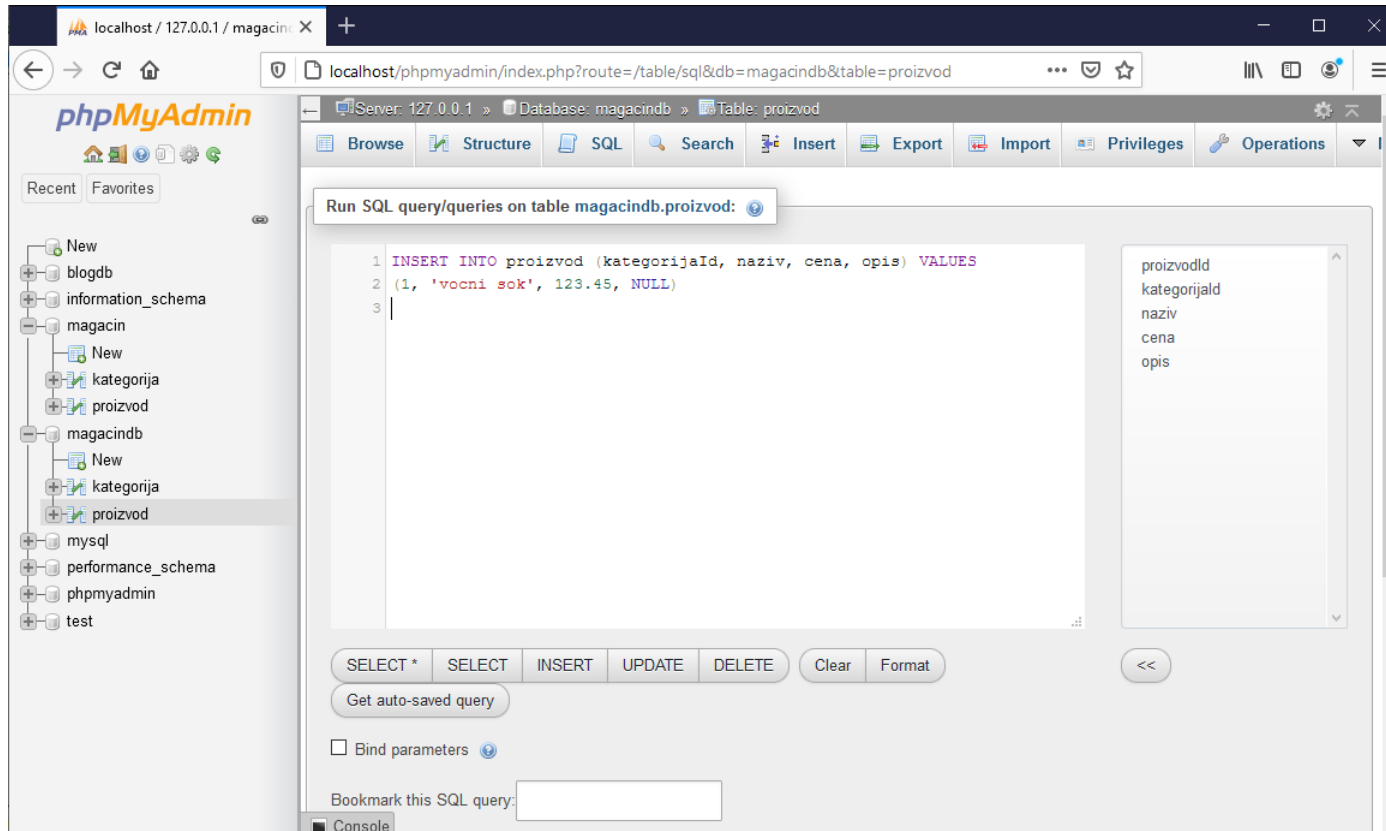
Below the query editor, there are buttons for 'SELECT \*', 'SELECT', 'INSERT', 'UPDATE', and 'DELETE', along with 'Clear' and 'Format' buttons. There is also a 'Get auto-saved query' button and a 'Bind parameters' checkbox. At the bottom, there is a 'Bookmark this SQL query:' field and a 'Go' button. The 'Delimit' dropdown is set to ';'. Other options include 'Show this query here again', 'Retain query box', 'Rollback when finished', and 'Enable foreign key checks' (checked).

SELECT \* FROM `kategorija`;

# Tabela proizvod

```
CREATE TABLE proizvod (  
  proizvodId int NOT NULL AUTO_INCREMENT PRIMARY KEY,  
  kategorijaId int NOT NULL,  
  naziv varchar(120) NOT NULL UNIQUE,  
  cena decimal(10,2) NOT NULL,  
  opis varchar(200) DEFAULT NULL,  
  CONSTRAINT FOREIGN KEY (kategorijaId) REFERENCES kategorija (kategorijaId)  
);
```

# Unos proizvoda



The screenshot shows the phpMyAdmin interface for a MySQL database named 'magacindb'. The current table selected is 'proizvod'. The SQL query editor contains the following query:

```
1 INSERT INTO proizvod (kategorijaId, naziv, cena, opis) VALUES
2 (1, 'vocni sok', 123.45, NULL)
3
```

The table structure on the right shows the following columns: proizvodId, kategorijaId, naziv, cena, and opis. Below the query editor, there are buttons for 'SELECT \*', 'SELECT', 'INSERT', 'UPDATE', and 'DELETE', along with 'Clear' and 'Format' buttons. The 'INSERT' button is highlighted. There is also a checkbox for 'Bind parameters' and a 'Bookmark this SQL query' field.

INSERT INTO proizvod VALUES  
(1, 1, 'Coca-Cola 1l PET', '80.00', NULL);

```
INSERT INTO proizvod VALUES
```

```
(1, 1, 'Coca-Cola 1l PET', '80.00', NULL);
```

```
INSERT INTO `proizvod` (`proizvodid`, `kategorijald`, `naziv`, `cena`, `opis`) VALUES
```

```
(2, 1, 'Sok pomorandza Happy day 1l', '155.00', NULL),
```

```
(3, 1, 'Kafa mlevena Grand Gold 200g', '240.00', NULL),
```

```
(4, 1, 'Sok pomorandza Next Classic 1l', '125.00', NULL),
```

```
(5, 1, 'Fanta limenka 0,33l', '50.00', NULL),
```

```
(6, 2, 'Jogurt Balans +probiotik 1.5kg Pet', '152.00', NULL),
```

```
(7, 2, 'Mleko ster.2.8%mm Moja kravica BPslim 1L', '100.00', NULL),
```

```
(8, 2, 'Sir President Somborska 500g', '260.00', NULL),
```

```
(9, 2, 'Kiselo mleko 2.8%mm Moja kravica 180g', '25.00', NULL),
```

```
(10, 2, 'Dukat SenSia 1kg', '114.00', NULL),
```

```
(11, 3, 'Krem Nutella cream 400g', '345.00', NULL),
```

```
(12, 3, 'Krem tabla Euro blok Eurocrem 50g', '50.00', NULL),
```

```
(13, 3, 'Cokolada Milka haselnuss 80g', '110.00', NULL),
```

```
(14, 3, 'Keks Plazma 300g', '179.00', NULL),
```

```
(15, 3, 'Karamela lesnik 200g', '153.00', NULL),
```

```
(16, 4, 'Beskvasni integralni hleb Maxi 500g', '100.00', NULL),
```

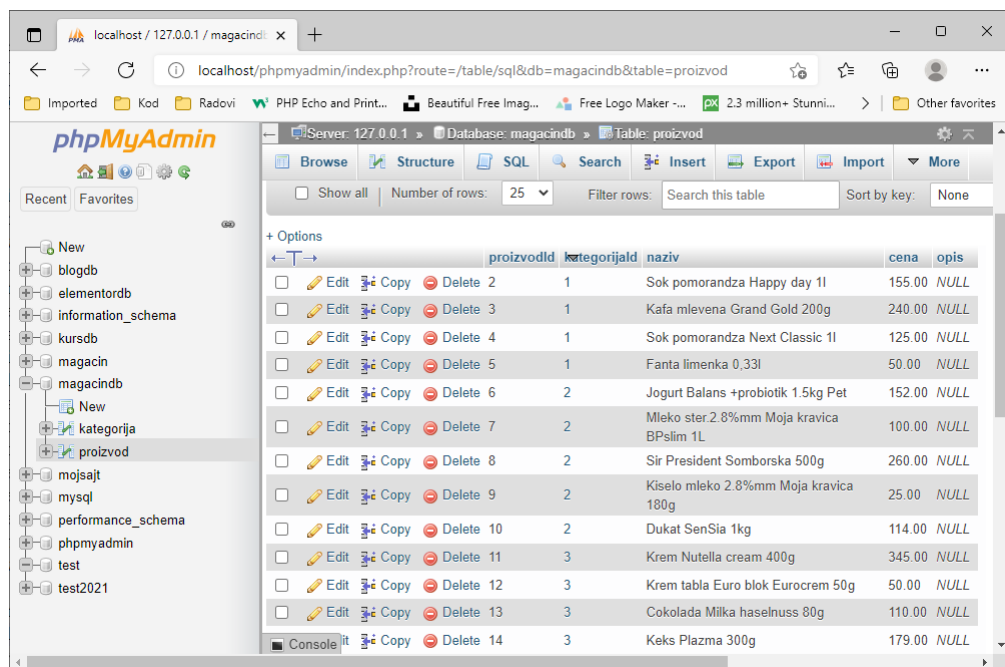
```
(17, 4, 'Somun svezi Tvojih 5 minuta 190g', '40.00', NULL),
```

```
(18, 4, 'Strudla mak Kikindska pekara 110g', '100.00', NULL),
```

```
(19, 4, 'Tost tamni Hleb&Kifle 500g', '145.00', NULL),
```

```
(20, 4, 'Integralni dvopek Tvojih 5 minuta 210g', '112.00', NULL);
```

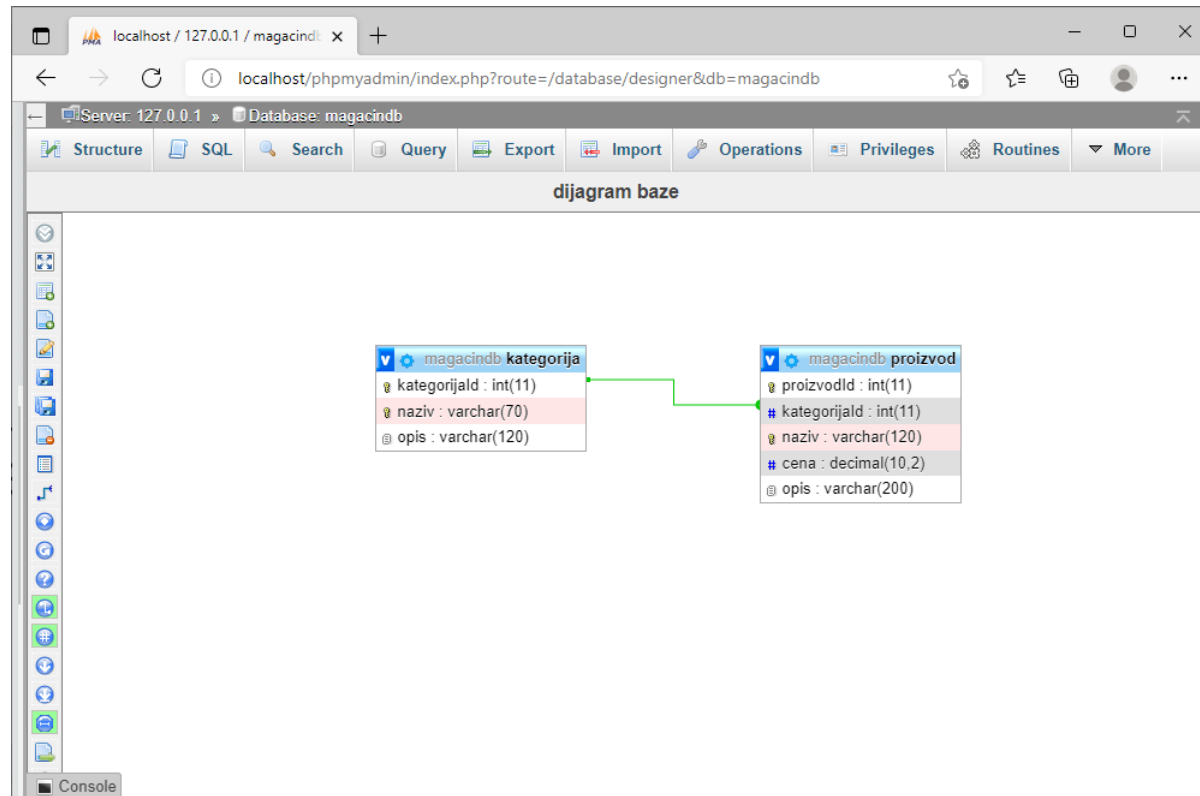
# Tabela sa proizvodima



The screenshot shows the phpMyAdmin interface for a database named 'magacindb'. The table 'proizvod' is selected, and its data is displayed in a table format. The table has columns for 'proizvodid', 'kategorijaid', 'naziv', 'cena', and 'opis'. The data includes 14 rows of products with their respective IDs, category IDs, names, prices, and descriptions.

| proizvodid | kategorijaid | naziv                                    | cena   | opis |
|------------|--------------|--|--------|------|
| 2          | 1            | Sok pomorandza Happy day 1l              | 155.00 | NULL |
| 3          | 1            | Kafa mlevena Grand Gold 200g             | 240.00 | NULL |
| 4          | 1            | Sok pomorandza Next Classic 1l           | 125.00 | NULL |
| 5          | 1            | Fanta limenka 0,33l                      | 50.00  | NULL |
| 6          | 2            | Jogurt Balans +probiotik 1.5kg Pet       | 152.00 | NULL |
| 7          | 2            | Mleko ster.2.8%mm Moja kravica BPslim 1L | 100.00 | NULL |
| 8          | 2            | Sir President Somborska 500g             | 260.00 | NULL |
| 9          | 2            | Kiselo mleko 2.8%mm Moja kravica 180g    | 25.00  | NULL |
| 10         | 2            | Dukat SenSia 1kg                         | 114.00 | NULL |
| 11         | 3            | Krem Nutella cream 400g                  | 345.00 | NULL |
| 12         | 3            | Krem tabla Euro blok Eurocrem 50g        | 50.00  | NULL |
| 13         | 3            | Cokolada Milka haselnuss 80g             | 110.00 | NULL |
| 14         | 3            | Keks Plazma 300g                         | 179.00 | NULL |

# Dijagram baze



# Primer UPDATE upita

```
UPDATE `kategorija` SET opis='prozvodi od svezeg mleka sirevi i dimljeni proizvodi'  
WHERE kategorijald = 2
```

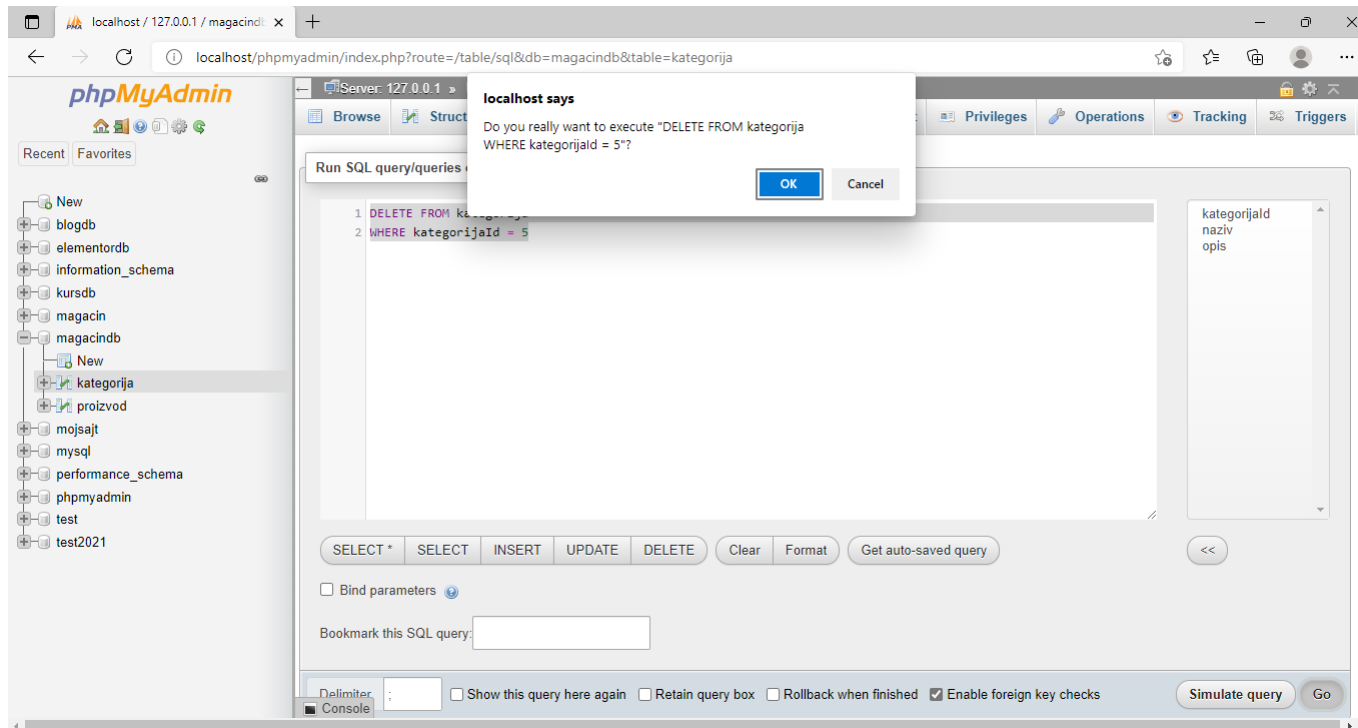
```
INSERT INTO `kategorija`(`kategorijald`, `naziv`, `opis`) VALUES (null,'test','opis test  
kategorije')
```

```
UPDATE kategorija SET naziv = 'Naziv1', opis = 'opis1'  
WHERE kategorijald = 5
```



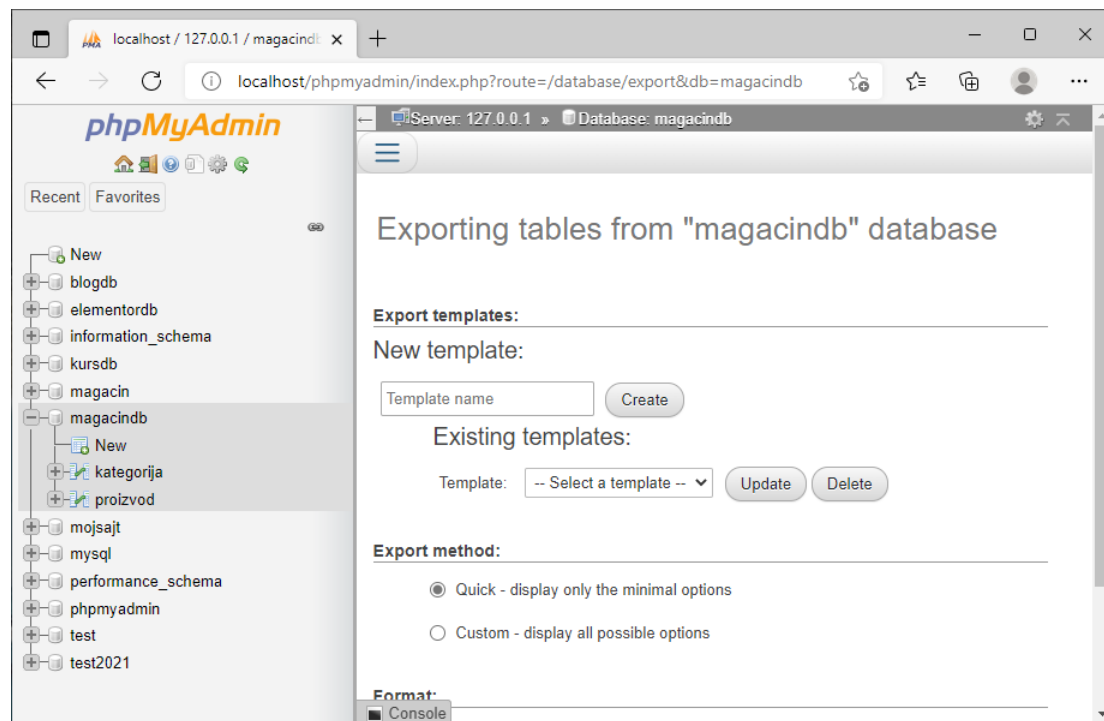
# Primer DELETE upita

DELETE FROM kategorija  
WHERE kategorijaId = 5



The screenshot shows the phpMyAdmin web interface in a browser window. The address bar indicates the URL is localhost/phpmyadmin/index.php?route=/table/sql&db=magacindb&table=kategorija. The interface displays a tree view of databases on the left, with 'magacindb' selected and 'kategorija' table highlighted. A modal dialog box titled 'localhost says' is open, asking for confirmation to execute the SQL query: 'DELETE FROM kategorija WHERE kategorijaId = 5?'. The dialog has 'OK' and 'Cancel' buttons. Below the dialog, the SQL query editor shows the query text. The interface also includes buttons for 'SELECT \*', 'SELECT', 'INSERT', 'UPDATE', 'DELETE', 'Clear', 'Format', and 'Get auto-saved query'. At the bottom, there are options for 'Bind parameters', 'Bookmark this SQL query', and 'Delimiters'.

# Eksport baze u fajl



# Importovanje sql fajla

The screenshot shows the phpMyAdmin web interface in a browser window. The address bar indicates the URL is localhost/phpmyadmin/index.php?route=/database/import&db=magacindb. The interface is for the 'magacindb' database on a server at 127.0.0.1. The main content area is titled 'Importing into the database "magacindb"'. It features several sections for configuring the import:

- File to import:** A section where a file can be selected. It includes a 'Choose File' button and shows 'magacindb.sql' as the selected file, with a '(Max: 40MiB)' limit. Below this, it states 'You may also drag and drop a file on any page.' and has a dropdown menu for 'Character set of the file:' set to 'utf-8'.
- Partial import:** A section with a checked checkbox and a text input field. The text reads: 'Allow the interruption of an import in case the script detects it is close to the PHP timeout limit. (This might be a good way to import large files, however it can break transactions.)' The input field is labeled 'Skip this number of queries (for SQL) starting from the first one:' and contains the value '0'.
- Other options:** A section with a checked checkbox labeled 'Enable foreign key checks'.
- Format:** A section with a dropdown menu currently set to 'Console'.

The left sidebar shows a tree view of databases, with 'magacindb' selected. The top navigation bar includes tabs for Structure, SQL, Search, Query, Export, Import, Operations, Privileges, Routines, Events, and More.

Konekcija na bazu

# Komunikacija PHP i MySQL-a

- MySQL se smatra prirodnom bazom podataka za PHP
- Kombinacija ove dve tehnologije je veoma široko rasprostranjena na Internetu
- Postoje različiti koncepti upravljanja MySQL-om kroz php
- Da bi PHP mogao da koristi mysql (odnosno, mysql funkcije) potrebno je da u PHP-u bude uključena **MySQLi** ekstenzija

# MySQL Improved Extension -MYSQLI

- Ekstenzija mysqli omogućava pristup funkcionalnostima mysql baze podataka (verzija mysql 4.1 ili veća)
- Klasa mysqli predstavlja konekciju između PHPa i MySQL baze podataka
- Pozivom konstruktora kreira se objekat koji predstavlja konekciju:

```
$conn = new mysqli($servername, $username, $password, $dbname);
```

# Svojstva i metode konekcionog objekta

- Svojstvo **connect\_error** vraća poruku greške iz poslednjeg pokušaja konekcije
- Svojstvo **error** vraća poslednju poruku greške pri pozivu metode konekcionog objekta
- Metoda **query()** koristi se za izvršavanje upita nad bazom podataka
- Metoda **prepare()** koristi se za kreiranje tzv, pripremljene naredbe
- Svojstvo **insert\_id** vraća vrednost generisanu od strane AUTO\_INCREMENT kolone nakon poslednjeg upita
- Svojstvo **affected\_rows** vraća broj redova pri izvršavanju INSERT, UPDATE ili DELETE upita

# Kreiranje konekcije

```
<?php
$servername = "localhost";
$username = "root";
$password = "";
$dbname = "magacin";

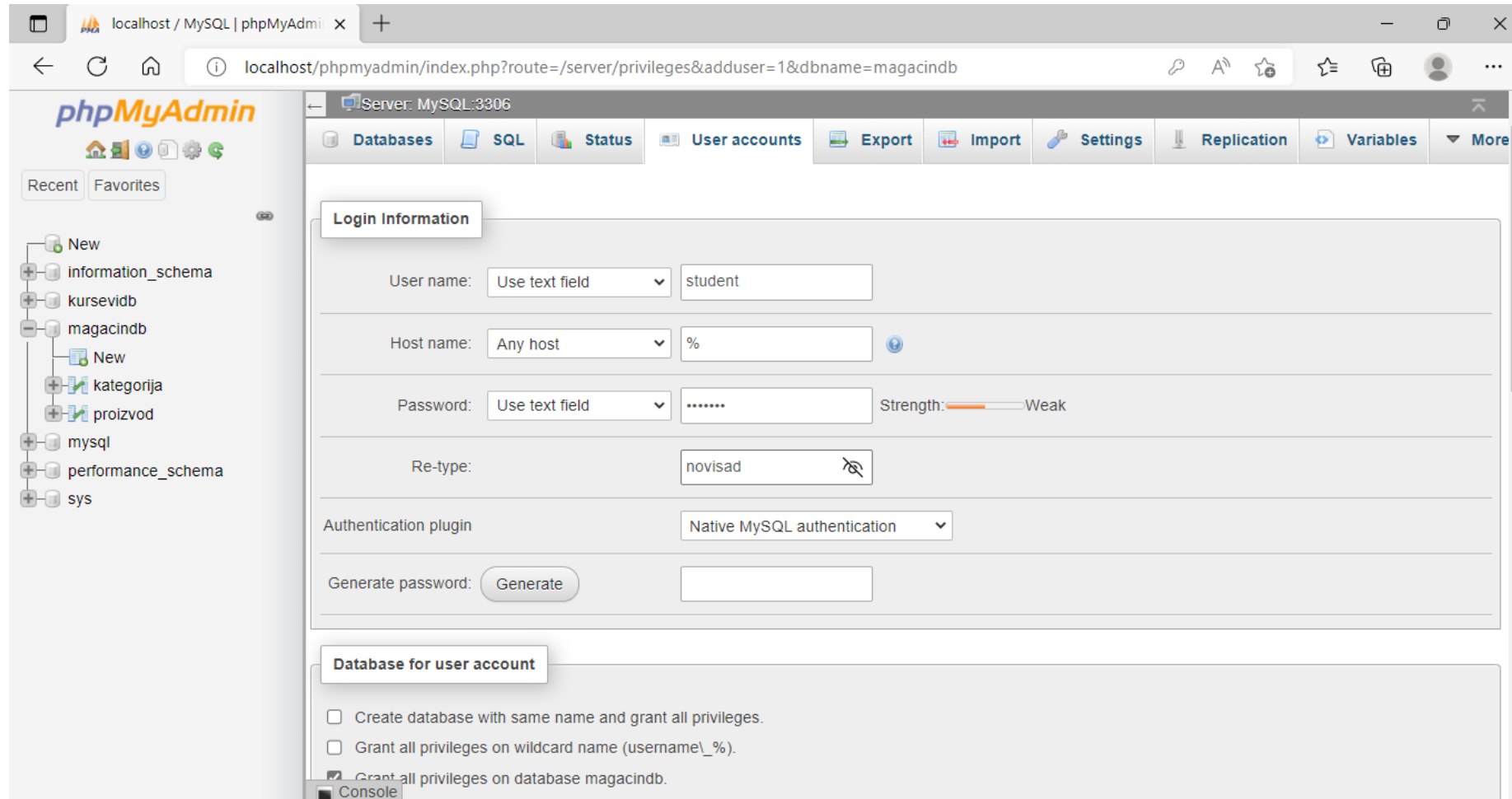
// kreiraj konekciju
$conn = new mysqli($servername, $username, $password, $dbname);

if ($conn->connect_error) {
    die("Greska pri uspostavljanju konekcije: " . $conn->connect_error);
}
echo "Uspostavljena konekcija";

$conn->close();
?>
```



# Kreiranje novog korisnika baze



The screenshot displays the phpMyAdmin web interface in a browser window. The address bar shows the URL: localhost/phpmyadmin/index.php?route=/server/privileges&adduser=1&dbname=magacindb. The interface includes a navigation menu on the left with a tree view of databases: information\_schema, kursevidb, magacindb (expanded to show 'New', kategorija, proizvod), mysql, performance\_schema, and sys. The main content area is titled 'Server: MySQL:3306' and contains a 'User accounts' tab. The 'Login Information' section includes the following fields:

- User name: dropdown set to 'Use text field', text input containing 'student'.
- Host name: dropdown set to 'Any host', text input containing '%', with a blue information icon.
- Password: dropdown set to 'Use text field', masked text input containing '.....', with a 'Strength' indicator showing a red bar and the word 'Weak'.
- Re-type: text input containing 'novisad'.
- Authentication plugin: dropdown set to 'Native MySQL authentication'.
- Generate password: a 'Generate' button and an empty text input field.

The 'Database for user account' section contains three checkboxes:

- Create database with same name and grant all privileges.
- Grant all privileges on wildcard name (username\\_%).
- Grant all privileges on database magacindb.

A 'Console' tab is visible at the bottom left of the main content area.

# Konekcija korisnika na bazu

```
<?php
$servername = "localhost";
$username = "student";
$password = "novisad";
$dbname = "magacindb";

// kreiraj konekciju
$conn = new mysqli($servername, $username, $password, $dbname);

if ($conn->connect_error) {
    die("Greska pri uspostavljanju konekcije: " . $conn->connect_error);
}
echo "Uspostavljena konekcija";

$conn->close();
?>
```

# Metoda **query()** objekta `mysqli`

- Izvršava upit nad bazom podataka
- Pri izvršavanju `SELECT` upita funkcija vraća **`mysqli_result`** objekat
  - Klasa `mysqli_result` predstavlja result set dobijen nakon izvršavanja upita nad bazom podataka
- Pri izvršavanju `INSERT`, `UPDATE` i `DELETE` upita vraća `TRUE` za uspešno izvršeni upit u protivnom vraća `FALSE`

# Klasa `mysqli_result`

- Predstavlja result set dobijen nakon izvršavanja upita nad bazom podataka
- Metoda **`fetch_assoc`** dohvata red iz result seta kao asocijativni niz
- Svaki poziv `fetch_assoc` funkcije vraća sledeće red iz result seta ili null ako više nema redova za čitanje
- Svojstvo **`num_rows`** daje broj redova u result setu

# Čitanje jednog reda

```
<?php

include "konekcija.php";

$sql = "SELECT * FROM Kategorija WHERE kategorijaId = 1";
$result = $conn->query($sql);

if ($result->num_rows > 0) {

    $row = $result->fetch_assoc();
    echo "id: " . $row['kategorijaId']. " Naziv: " . $row['naziv'] . "<br>";

} else {
    echo "0 rezultata";
}
$conn->close();
?>
```

# Čitanje tabele

```
<?php
include "konekcija.php";

$sql = "SELECT kategorijaId, naziv, opis FROM kategorija";
$result = $conn->query($sql);

if ($result->num_rows > 0) {

    while ($row = $result->fetch_assoc()) {
        echo "id: " . $row['kategorijaId'] . " Naziv: " . $row['naziv'] . "<br>";
    }
} else {
    echo "0 rezultata";
}
$conn->close();
?>
```

# Unos jednog reda

```
<?php
    include "konekcija.php";

    $sql = "INSERT INTO kategorija (naziv, opis)
    VALUES ('test', 'Opis test kategorije)";

    if ($conn->query($sql) === true) {
        echo "Ubacena nova kategorija";
    } else {
        echo "Greska: ". $conn->error;
    }

    $conn->close();
?>
```

# Id ubačenog reda

```
<?php
include "konekcija.php";

$sql = "INSERT INTO Kategorija (naziv, opis)
VALUES ('test1', 'Opis test1 kategorije)";

if ($conn->query($sql) === true) {
    $id = $conn->insert_id;
    echo "Ubacena nova kategorija: Id = $id<br>";
} else {
    echo "Greska:" . $conn->error;
}

$conn->close();
?>
```



# Brisanje podataka

```
<?php
include "konekcija.php";

$sql = "DELETE FROM kategorija
  where kategorijaId = 5";

if ($conn->query($sql) === true) {
    if ($conn->affected_rows >0) {
        echo "Obrisana kategorija";
    }
    else{
        echo "Ne postoji red sa datim id-om";
    }
} else {
    echo "Greska: " . $conn->error;
}
$conn->close();
?>
```

# Promena podataka

```
<?php
include "konekcija.php";

$sql = "UPDATE Kategorija
SET naziv = 'Test1', opis = 'opis1' where kategorijaId = 7";

if ($conn->query($sql) === true) {
    echo "Promenjena kategorija";
} else {
    echo "Greska: " . $sql . "<br>" . $conn->error;
}

$conn->close();
?>
```

# Parametarski upiti

- Parametarski upiti se mogu izvršavati korišćenjem pripremljenih naredbi (prepared statement)
- Izvršavanje pripremljene naredbe se sastoji iz dva koraka: priprema i izvršavanje
- Pripremljena naredba se šalje do servera
- U toku faze izvršavanja vrši se povezivanje vrednosti parametara i njihovo slanje do servera
- Pripremljene naredbe se koriste kod višestrukog izvršavanja parametarskih upita
- Pripremljene naredbe su otporne na SQL injection

# Parametarski upiti interpolacijom

```
<?php
include "konekcija.php";
$naziv = "Bela tehnika";
$opis = "Bela tehnika za kucu";
$sql = "INSERT INTO Kategorija (naziv, opis) VALUES ('{$naziv}', '{$opis}')";
if($conn->query($sql) === true){
    $id = $conn->insert_id;
    echo "Ubacena kategorija id: $id<br>";
    echo "Broj ubacenih redova: $conn->affected_rows";
}else {
    echo "Greska ". $conn->error;
}

?>
```

```
$sql = "INSERT INTO Kategorija (naziv, opis) VALUES ('$naziv', '$opis')";
```

# Parametarski upiti

```
<?php
include "konekcija.php";

$sql = "INSERT INTO kategorija (naziv, opis) VALUES (?, ?)";
//prepared statement
//prepare
$stmt = $conn->prepare($sql);

//bind
$stmt->bind_param("ss",$naziv, $opis);

$naziv = "Kategorija3";
$opis = "Opis kategorije 3";

//execute
if($stmt->execute()){
    $id = $conn->insert_id;
    echo "Ubacena nova kategorija: Id = $id<br>";
    echo "Broj redova: " . $stmt->affected_rows;
}
else {
    echo "Greska: " . $sql . "<br>" . $conn->error;
}

$conn->close();
?>
```

i, d, s  
int  
double,  
string