Web Security I

Question 1 ***Same-Origin Policy (SOP)***

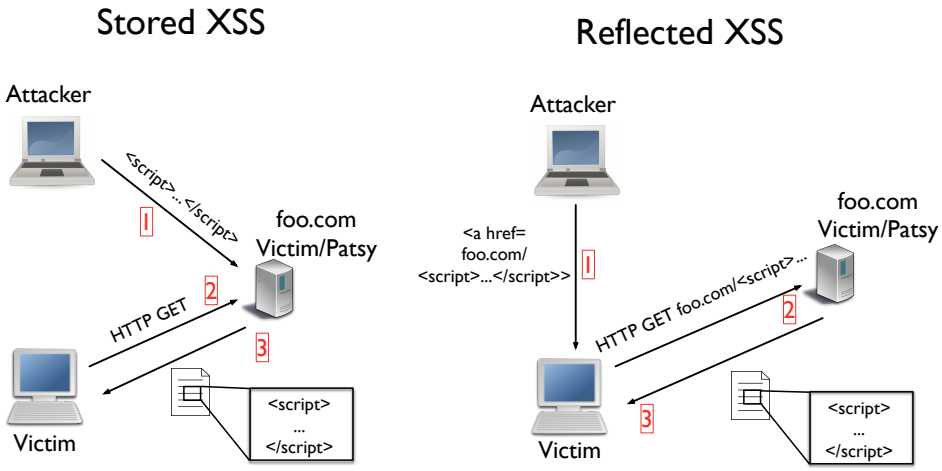
The Same-Origin Policy helps browsers maintain a sandboxed model by preventing certain webpages from accessing others. Two resources (can be images, scripts, HTML, etc.) have the same origin if they have the same protocol, port, and host. As an example, the URL `http://inst.berkeley.edu/eecs` has the protocol HTTP; its port is implicitly 80, the default for HTTP; and the host is inst.berkeley.edu.

Fill in the table below indicating whether the webpages shown can be accessed by `http://amazon.com/store/item/83`.

Origin	Can access?	Reason if not
http://store.amazon.com/item/83		
http://amazon.com/user/56		
https://amazon.com/store/item/345		
http://amazon.com:2000/store		
http://amazin.com/store		

Question 2 ***Cross-Site Scripting (XSS)***

The figure below shows the two different types of XSS.



As part of your daily routine, you are browsing through the news and status updates of your friends on the social network FaceChat.

(a) While looking for a particular friend, you notice that the text you entered in the search string is displayed in the result page. Next to you sits a suspicious looking student with a black hat who asks you to try queries such as

```
<script>alert(42);</script>
```

in the search field. What is this student trying to test?

(b) The student also asks you to post the code snippet to the wall of one of your friends. How is this test different from part (a)?

(c) The student is delighted to see that your browser spawns a JavaScript pop-up in both cases. What are the security implications of this observation? Provide a malicious URL that steals other users' cookies.

(d) Why does an attacker even need to bother with XSS? Wouldn't it be much easier to just create a malicious page with a script that steals *all* cookies of *all* pages from the user's browser?

(e) FaceChat finds out about this vulnerability and releases a patch. You find out that they fixed the problem by removing all instances of `<script>` and `</script>`. Why is this approach not sufficient to stop XSS attacks? What's a better way to fix XSS vulnerabilities?

Question 3 ***SQL Injection***

(a) Explain the bug in this PHP code. How would you exploit it? Write what you would need to do to delete all of the tables in the database.

```
$query = "SELECT name FROM users WHERE uid = $UID";
// Then execute the query.
```

(Here, `$UID` represents a URL parameter named `UID` supplied in the HTTP request. The actual representation of such a value in PHP is a bit messier than we've shown here. We leave out the syntactic details so we can focus on the functionality.)

(b) How does blacklisting work as a defense? What are some difficulties with blacklisting?

(c) What is the best way to fix this bug?

Question 4 ***Cross-site not scripting***

Consider a simple web messaging service. You receive messages from other users. The page shows all messages sent to you. Its HTML looks like this:

```
<pre>
Mallory: Do you have time for a conference call?
Steam: Your account verification code is 86423
Mallory: Where are you? This is <b>important!!!</b>
Steam: Thank you for your purchase
       <img src="https://store.steampowered.com/assets/thankyou.png">
</pre>
```

The user is off buying video games from Steam, while Mallory is trying to get ahold of them.

Users can send **arbitrary HTML code** that will be concatenated into the page, **unsanitized**. Sounds crazy, doesn't it? However, they have a magical technique that prevents *any* JavaScript code from running. Period.

Discuss what an attacker could do to snoop on another user's messages. What specially crafted messages could Mallory have sent to steal this user's account verification code?