Exercise 3

```
Hypertext Transfer Protocol
  HTTP/1.1 200 OK\r\n
    Date: Tue, 23 Sep 2003 05:29:50 GMT\r\n
    Server: Apache/2.0.40 (Red Hat Linux)\r\n
    Last-Modified: Tue, 23 Sep 2003 05:29:00 GMT\r\n
    ETag: "1bfed-49-79d5bf00"\r\n
    Accept-Ranges: bytes\r\n
  Content-Length: 73\r\n
    Keep-Alive: timeout=10, max=100\r\n
    Connection: Keep-Alive\r\n
    Content-Type: text/html; charset=ISO-8859-1\r\n
    \r\n
    [HTTP response 1/2]
    [Time since request: 0.024143000 seconds]
    [Request in frame: 10]
    [Next request in frame: 13]
    [Next response in frame: 14]
    [Request URI: http://gaia.cs.umass.edu/favicon.ico]
    File Data: 73 bytes
Line-based text data: text/html (3 lines)
```

Question 1: What is the status code and phrase returned from the server to the client browser?

HTTP/1.1 200 OK\r\n

Status code: 200

Phrase: OK

Question 2: When was the HTML file the browser retrieves last modified at the server? Does the response also contain a DATE header? How are these two fields different?

Last-Modified: Tue, 23 Sep 2003 05:29:00 GMT\r\n.

Yes, the response also contains a DATE header.

Date: Tue, 23 Sep 2003 05:29:50 GMT\r\n.

Date and Last Modified are different, as date is the date and time that the response was generated, whilst last modified is the time and date that the requested object was last modified.

Question 3: Is the connection established between the browser and the server persistent or non-persistent? How can you infer this?

The connection established between the browser and the server is persistent. This can be inferred from the connection field being "Keep-Alive". A persistent connection means that multiple requests and responses can sent over the same connection.

Question 4: How many bytes of content are being returned to the browser?

File Data: 73 bytes

Question 5: What is the data contained inside the HTTP response packet?

Text and html data.

Exercise 4

```
Hypertext Transfer Protocol
  HTTP/1.1 200 OK\r\n
  Date: Tue, 23 Sep 2003 05:35:50 GMT\r\n
  Server: Apache/2.0.40 (Red Hat Linux)\r\n
  Last-Modified: Tue, 23 Sep 2003 05:35:00 GMT\r\n
  ETag: "1bfef-173-8f4ae900"\r\n
  Accept-Ranges: bytes\r\n
  Content-Length: 371\r\n
  Keep-Alive: timeout=10, max=100\r\n
  Connection: Keep-Alive\r\n
  Content-Type: text/html; charset=ISO-8859-1\r\n
  \r\n
  [HTTP response 1/2]
  [Time since request: 0.026634000 seconds]
  [Request in frame: 8]
  [Next request in frame: 14]
  [Next response in frame: 15]
  [Request URI: http://gaia.cs.umass.edu/ethereal-labs/lab2-2.html]
  File Data: 371 bytes
Line-based text data: text/html (10 lines)
```

Question 1: Inspect the contents of the first HTTP GET request from the browser to the server. Do you see an "IF-MODIFIED-SINCE" line in the HTTP GET?

There is not an "IF-MODIFIED-SINCE" line in the first HTTP GET.

Question 2: Does the HTTP response from the server indicate the last time that the requested file was modified?

Last-Modified: Tue, 23 Sep 2003 05:35:00 GMT\r\n.

Question 3: Now inspect the contents of the second HTTP GET request from the browser to the server. Do you see the "IF-MODIFIED-SINCE:" and "IF-NONE-MATCH" lines in the HTTP GET? If so, what information is contained in these header lines?

If-Modified-Since: Tue, 23 Sep 2003 05:35:00 GMT\r\n.

If-None-Match: "1bfef-173-8f4ae900"\r\n.

If-Modified-Since contains a date and time that the browsers resources were last modified or received. If-None-Match contains an e-tag value linked to the browsers resources.

Question 4: What is the HTTP status code and phrase returned from the server in response to this second HTTP GET? Did the server explicitly return the file's contents? Explain.

```
Hypertext Transfer Protocol
  HTTP/1.1 304 Not Modified\r\n
  Date: Tue, 23 Sep 2003 05:35:53 GMT\r\n
  Server: Apache/2.0.40 (Red Hat Linux)\r\n
  Connection: Keep-Alive\r\n
  Keep-Alive: timeout=10, max=99\r\n
  ETag: "1bfef-173-8f4ae900"\r\n
  \r\n
  [HTTP response 2/2]
  [Time since request: 0.022826000 seconds]
  [Prev request in frame: 8]
  [Prev response in frame: 10]
  [Request in frame: 14]
  [Request URI: http://gaia.cs.umass.edu/ethereal-labs/lab2-2.html]
```

HTTP/1.1 304 Not Modified\r\n

Status code: 304

Phrase: Not Modified

The server has not explicitly returned the file's contents. The status code informs the browser that the requested resources has not been modified as the Etag from the "IF-NONE-MATCH" is the same as the GET request. This saves resources as the server does not have to send the

entire resource every time, as the locally cached version that the browser has is appropriate as no resources have been changed.

Question 5: What is the value of the Etag field in the 2nd response message, and how is it used? Is the Etag value the same as in the 1 st response?

ETag: "1bfef-173-8f4ae900"\r\n

The ETag value is used for web cache validation. If it matches ETag value with the ETag value in the GET request, it means the resource has not been modified.

Exercise 5

```
Received from 127.0.0.1: PING 10881 1696073853865.7039
   Reply not sent.
Received from 127.0.0.1: PING 10882 1696073854466.509
   Reply sent.
Received from 127.0.0.1: PING 10883 1696073854492.053
   Reply not sent.
Received from 127.0.0.1: PING 10884 1696073855093.5403
   Reply not sent.
Received from 127.0.0.1: PING 10885 1696073855695.0422
   Reply sent.
Received from 127.0.0.1: PING 10886 1696073855718.0437
   Reply not sent.
Received from 127.0.0.1: PING 10887 1696073856319.394
   Reply sent.
Received from 127.0.0.1: PING 10888 1696073856384.969
   Reply not sent.
Received from 127.0.0.1: PING 10889 1696073856986.048
   Reply sent.
Received from 127.0.0.1: PING 10890 1696073857057.7888
   Reply not sent.
Received from 127.0.0.1: PING 10891 1696073857658.2349
   Reply not sent.
Received from 127.0.0.1: PING 10892 1696073858259.8137
   Reply sent.
Received from 127.0.0.1: PING 10893 1696073858299.1172
   Reply not sent.
Received from 127.0.0.1: PING 10894 1696073858899.7659
   Reply sent.
Received from 127.0.0.1: PING 10895 1696073859067.209
   Reply sent.
Received from 127.0.0.1: PING 10896 1696073859269.6152
   Reply not sent.
Received from 127.0.0.1: PING 10897 1696073859870.039
   Reply sent.
Received from 127.0.0.1: PING 10898 1696073859958.179
   Reply sent.
Received from 127.0.0.1: PING 10899 1696073860080.474
   Reply sent.
Received from 127.0.0.1: PING 10900 1696073860088.668
   Reply sent.
```

```
Nick  :lab2$ python3 PingClient.py 127.0.0.1 1100
ping to 127.0.0.1, seq = 10881, time out
ping to 127.0.0.1, seq = 10882, rtt = 25 ms
ping to 127.0.0.1, seq = 10883, time out
ping to 127.0.0.1, seq = 10884, time out
ping to 127.0.0.1, seq = 10885, rtt = 22 ms
ping to 127.0.0.1, seq = 10886, time out
ping to 127.0.0.1, seq = 10887, rtt = 65 ms
ping to 127.0.0.1, seq = 10888, time out
ping to 127.0.0.1, seq = 10889, rtt = 71 ms
ping to 127.0.0.1, seq = 10890, time out
ping to 127.0.0.1, seq = 10891, time out
ping to 127.0.0.1, seq = 10892, rtt = 39 ms
ping to 127.0.0.1, seq = 10893, time out
ping to 127.0.0.1, seq = 10894, rtt = 167 ms
ping to 127.0.0.1, seq = 10895, rtt = 202 ms
ping to 127.0.0.1, seq = 10896, time out
ping to 127.0.0.1, seq = 10897, rtt = 88 ms
ping to 127.0.0.1, seq = 10898, rtt = 122 ms
ping to 127.0.0.1, seq = 10899, rtt = 8 ms
ping to 127.0.0.1, seq = 10900, rtt = 72 ms
20 pings done
MINIMUM RTT = 8 ms, MAXIMUM RTT = 202 ms, AVERAGE RTT = 80 ms
```