Homework 1 Report

Yihui Wang
UFID# 8316-4355

Function Description:

1. function bid() public payable:

```
1   function bid() public payable {
2       require(msg.value > highestBid);
3       if(highestBidder != address(0x0)){
4         pendingReturns[highestBidder] = highestBid;
5       }
6       highestBid = msg.value;
7       highestBidder = msg.sender;
8   }
```

In the line 2, I use a "require" to ensure that the bid is higher than the current highest bid, or the bid will be invalid. From line 3 to 4, I store the previous bid in pendingReturns, which can be withdrawn when the bidder triggers withdraw() function. In line 6 to 7, the newest highest bid the address of the bidder is updated.

2. function withdraw() public returns (bool):

```
1   function withdraw() public returns (bool) {
2       uint amount = pendingReturns[msg.sender];
3       if(amount > 0){
4         pendingReturns[msg.sender] = 0;
5       }
6       if(!msg.sender.send(amount)){
7         pendingReturns[msg.sender] = amount;
8         return false;
9       }
10        return true;
11  }
```

In the line 2 to 5, I store the bid of the bidder in a variable "amount", and then check whether the amount is more than 1. If the amount is more than 1, I set the bid in the pendingReturns to 0, which can avoid the reentrancy attack discussed in class. From line 6 to 8, if the bid does not send back to the bidder's address correctly, I set the bid in pendingReturns back to the amount stored in the variable "amount" and return false.

3. function auctionEnd() public:

```
1   function auctionEnd() public {
2       require(msg.sender == beneficiary && !end);
```

```
3       end = true;
4       msg.sender.transfer(highestBid);
5   }
```

In the line 2, I use a “require” to check whether the user who trigger the auctionEnd() function is the beneficiary. Besides, I also check whether the auction has already ended, which can avoid multiple calls. In the line 3 to 4, I set the Boolean variable “end” to true, which means the auction is end, and then transfer the highest bid to the beneficiary.

Experiments on sending/withdrawing bids:

1. Account 1 sends a bid of 10 ETH:

```
truffle(ganache)> let accounts = await web3.eth.getAccounts()
undefined
truffle(ganache)> accounts
[
  '0x45734f25fB1bE104e0fA9cB71A38bD86E0B4353D',
  '0xbfF7b82a102a89375835CB69b3735c53a40f48aA',
  '0x130ecaAcFb09e6Ef66d75FB46A552EBfE37136d3',
  '0x8a9bc2723d2e886dAc245F0ac61e7c2ce44A31C6',
  '0x08e0f3f180aD252f5Dc5BE1cD464127686ecEe04',
  '0x99a3d6587fAbBf4407F85f89D7B7a483e0cF9A9e',
  '0xf9fb4B656CE9925d870e5B3B4f5418A7Fe435985',
  '0x76bC50dd00eDA7234Af39A7b983ceC1a10545E23',
  '0x13C1b78B3256A9C275382cA479E5c545673A7F49',
  '0x660FCe3C8Ea922dDc1E068aa9991A33ba1ebEaf0'
]
truffle(ganache)> instance.bid({from: accounts[1], value: 1000000000000000000})
{
  tx: '0x9bd60c90307bf2d7cb408c85d262e855176a8cf15c20abefac8cc84a56bd06be',
  receipt: {
    transactionHash: '0x9bd60c90307bf2d7cb408c85d262e855176a8cf15c20abefac8cc84a
56bd06be',
    transactionIndex: 0,
    blockHash: '0xb66ae3dde15c9325ecdaba232bd8f4f864eb3f79223d4a96a4dd7fea44a321
b5',
    blockNumber: 5,
    from: '0xbff7b82a102a89375835cb69b3735c53a40f48aa',
    to: '0x91fdb3d54cff65589f932d4c67672e4bce18153d',
    gasUsed: 62142,
    cumulativeGasUsed: 62142,
    contractAddress:     ,
    logs: [],
    status: true,
    logsBloom: '0x00000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000',
    v: '0x1b',
    r: '0xc058f9929a67dd7bb98d1ac2113c829330e09b187835cd04509e0120e772eaa3',
    s: '0x2e628eaab3ba96d5e8c3c4e270b8ee634d1064cad6b48e559f852a81126556bf',
    rawLogs: []
  },
  logs: []
}
```

2. Check the balance of account1:

The balance of account 1 decreases to 89 ETH.

```
truffle(ganache)> let balance1 = await web3.eth.getBalance(accounts[1])
undefined
truffle(ganache)> balance1
'89998757160000000000'
```

3. Account 2 sends a bid of 5 ETH:

It returns an error since the bid should be higher than the current highest bid 10 ETH .

```
truffle(ganache)> instance.bid({from: accounts[2], value: 5000000000000000000})
Uncaught:
Error: Returned error: VM Exception while processing transaction: revert    at P
romiEvent (/usr/local/lib/node_modules/truffle/build/webpack:/packages/contract/
lib/promievent.js:9:1)
    at TruffleContract.bid (/usr/local/lib/node_modules/truffle/build/webpack:/p
ackages/contract/lib/execute.js:169:1)
    at evalmachine.<anonymous>:0:10
    at sigintHandlersWrap (vm.js:274:15)
    at Script.runInContext (vm.js:128:14)
    at runScript (/usr/local/lib/node_modules/truffle/build/webpack:/packages/co
re/lib/console.js:222:1)
    at Console.interpret (/usr/local/lib/node_modules/truffle/build/webpack:/pac
kages/core/lib/console.js:237:1)
    at ReplManager.interpret (/usr/local/lib/node_modules/truffle/build/webpack:
/packages/core/lib/repl.js:131:1)
    at bound (domain.js:429:14)
    at REPLServer.runBound [as eval] (domain.js:442:12)
    at REPLServer.onLine (repl.js:759:10)
    at REPLServer.emit (events.js:321:20)
    at REPLServer.EventEmitter.emit (domain.js:485:12)
    at REPLServer.Interface._onLine (readline.js:327:10)
    at REPLServer.Interface._line (readline.js:656:8)
    at REPLServer.Interface._ttyWrite (readline.js:997:14)
    at REPLServer.self._ttyWrite (repl.js:850:9)
    at ReadStream.onkeypress (readline.js:203:10)
    at ReadStream.emit (events.js:321:20)
    at ReadStream.EventEmitter.emit (domain.js:485:12)
    at emitKeys (internal/readline/utils.js:450:14)
    at emitKeys.next (<anonymous>) {
  hijackedStack: 'Error: Returned error: VM Exception while processing transacti
on: revert\n' +
    '    at Object.ErrorResponse (/usr/local/lib/node_modules/truffle/build/webp
ack:/node_modules/web3-core-helpers/src/errors.js:29:1)\n' +
    '    at /usr/local/lib/node_modules/truffle/build/webpack:/node_modules/web3
-core-requestmanager/src/index.js:140:1\n' +
    '    at /usr/local/lib/node_modules/truffle/build/webpack:/packages/provider
/wrapper.js:112:1\n' +
    '    at XMLHttpRequest.request.onreadystatechange (/usr/local/lib/node_modul
es/truffle/build/webpack:/node_modules/web3-providers-http/src/index.js:96:1)\n'
 +
    '    at XMLHttpRequestEventTarget.dispatchEvent (/usr/local/lib/node_modules
/truffle/build/webpack:/node_modules/xhr2-cookies/dist/xml-http-request-event-ta
rget.js:34:1)\n' +
    '    at XMLHttpRequest._setReadyState (/usr/local/lib/node_modules/truffle/b
uild/webpack:/node_modules/xhr2-cookies/dist/xml-http-request.js:208:1)\n' +
    '    at XMLHttpRequest._onHttpResponseEnd (/usr/local/lib/node_modules/truff
le/build/webpack:/node_modules/xhr2-cookies/dist/xml-http-request.js:318:1)\n' +
    '    at IncomingMessage.<anonymous> (/usr/local/lib/node_modules/truffle/bui
ld/webpack:/node_modules/xhr2-cookies/dist/xml-http-request.js:289:47)\n' +
    '    at IncomingMessage.emit (events.js:333:22)\n' +
    '    at IncomingMessage.EventEmitter.emit (domain.js:547:15)\n' +
    '    at endReadableNT (_stream_readable.js:1201:12)\n' +
    '    at processTicksAndRejections (internal/process/task_queues.js:84:21)'
}
```

4. Account 2 sends a bid of 15 ETH:

```
truffle(ganache)> instance.bid({from: accounts[2], value: 1500000000000000000})

{
  tx: '0x63dbb2083371f264fe6b95e7b17870d298aa35ba19bc5be69d57cb4f7aef357b',
  receipt: {
    transactionHash: '0x63dbb2083371f264fe6b95e7b17870d298aa35ba19bc5be69d57cb4f
7aef357b',
    transactionIndex: 0,
    blockHash: '0xae8629b4c651036bccee32ad9f8bde9205bada48214c125d7928c5f568036e
c0',
    blockNumber: 7,
    from: '0x130ecaacfb09e6ef66d75fb46a552ebfe37136d3',
    to: '0x91fdb3d54cff65589f932d4c67672e4bce18153d',
    gasUsed: 52682,
    cumulativeGasUsed: 52682,
    contractAddress:     ,
    logs: [],
    status: true,
    logsBloom: '0x00000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000',
    v: '0x1c',
    r: '0x8927d1c509432d921b67f0711de0397319ace2b82fd6e56d4e7e2c0b0a98adb0',
    s: '0x801beeec7f1a67d30896a35197ccb4a48dffc1576c0829db234b84349ba01b7',
    rawLogs: []
  },
  logs: []
}
```

5. Account 1 withdraws his bid:

```
truffle(ganache)> instance.withdraw({from: accounts[1]})
{
  tx: '0x6b5bb59c8ee0d3bf0a781e5d234f3e4b8e07bb2b022c6506eb97310392ae8efb',
  receipt: {
    transactionHash: '0x6b5bb59c8ee0d3bf0a781e5d234f3e4b8e07bb2b022c6506eb97310
392ae8efb',
    transactionIndex: 0,
    blockHash: '0xfb858bc645e7fa67c3e3f1f8bdd2abd4b59eeb44e64c9cfd58ec76c6143bf
2ba',
    blockNumber: 8,
    from: '0xbff7b82a102a89375835cb69b3735c53a40f48aa',
    to: '0x91fdb3d54cff65589f932d4c67672e4bce18153d',
    gasUsed: 19465,
    cumulativeGasUsed: 19465,
    contractAddress:     ,
    logs: [],
    status: true,
    logsBloom: '0x00000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000',
    v: '0x1b',
    r: '0xe046e1be79af292eb730def3d6e765aba18887001ee6cf78ad46b61759b250ba',
    s: '0x6119d95555d90d143e5beae571d2cf5b312df9a207a0316b27149e9cee39d4df',
    rawLogs: []
  },
  logs: []
}
```

6. Check the balance of account 1:

The balance of account 1 increases to 99 ETH.

```
truffle(ganache)> let balance11 = await web3.eth.getBalance(accounts[1])
undefined
truffle(ganache)> balance11
'99998367860000000000'
```

7. Account 1 ends the Auction:

It returns an error since only the beneficiary can end the Auction.

```
truffle(ganache)> instance.auctionEnd({from: accounts[1]})
Uncaught:
Error: Returned error: VM Exception while processing transaction: revert    at
PromiEvent (/usr/local/lib/node_modules/truffle/build/webpack:/packages/contrac
t/lib/promievent.js:9:1)
    at TruffleContract.auctionEnd (/usr/local/lib/node_modules/truffle/build/we
bpack:/packages/contract/lib/execute.js:169:1)
    at evalmachine.<anonymous>:0:10
    at sigintHandlersWrap (vm.js:274:15)
    at Script.runInContext (vm.js:128:14)
    at runScript (/usr/local/lib/node_modules/truffle/build/webpack:/packages/c
ore/lib/console.js:222:1)
    at Console.interpret (/usr/local/lib/node_modules/truffle/build/webpack:/pa
ckages/core/lib/console.js:237:1)
    at ReplManager.interpret (/usr/local/lib/node_modules/truffle/build/webpack
:/packages/core/lib/repl.js:131:1)
    at bound (domain.js:429:14)
    at REPLServer.runBound [as eval] (domain.js:442:12)
    at REPLServer.onLine (repl.js:759:10)
    at REPLServer.emit (events.js:321:20)
    at REPLServer.EventEmitter.emit (domain.js:485:12)
    at REPLServer.Interface._onLine (readline.js:327:10)
    at REPLServer.Interface._line (readline.js:656:8)
    at REPLServer.Interface._ttyWrite (readline.js:997:14)
    at REPLServer.self._ttyWrite (repl.js:850:9)
    at ReadStream.onkeypress (readline.js:203:10)
    at ReadStream.emit (events.js:321:20)
    at ReadStream.EventEmitter.emit (domain.js:485:12)
    at emitKeys (internal/readline/utils.js:450:14)
    at emitKeys.next (<anonymous>) {
  hijackedStack: 'Error: Returned error: VM Exception while processing transact
ion: revert\n' +
    '    at Object.ErrorResponse (/usr/local/lib/node_modules/truffle/build/web
pack:/node_modules/web3-core-helpers/src/errors.js:29:1)\n' +
    '    at /usr/local/lib/node_modules/truffle/build/webpack:/node_modules/web
3-core-requestmanager/src/index.js:140:1\n' +
    '    at /usr/local/lib/node_modules/truffle/build/webpack:/packages/provide
r/wrapper.js:112:1\n' +
    '    at XMLHttpRequest.request.onreadystatechange (/usr/local/lib/node_modu
les/truffle/build/webpack:/node_modules/web3-providers-http/src/index.js:96:1)\
n' +
    '    at XMLHttpRequestEventTarget.dispatchEvent (/usr/local/lib/node_module
s/truffle/build/webpack:/node_modules/xhr2-cookies/dist/xml-http-request-event-
target.js:34:1)\n' +
    '    at XMLHttpRequest._setReadyState (/usr/local/lib/node_modules/truffle/
build/webpack:/node_modules/xhr2-cookies/dist/xml-http-request.js:208:1)\n' +
    '    at XMLHttpRequest._onHttpResponseEnd (/usr/local/lib/node_modules/truf
fle/build/webpack:/node_modules/xhr2-cookies/dist/xml-http-request.js:318:1)\n'
 +
    '    at IncomingMessage.<anonymous> (/usr/local/lib/node_modules/truffle/bu
ild/webpack:/node_modules/xhr2-cookies/dist/xml-http-request.js:289:47)\n' +
    '    at IncomingMessage.emit (events.js:333:22)\n' +
    '    at IncomingMessage.EventEmitter.emit (domain.js:547:15)\n' +
    '    at endReadableNT (_stream_readable.js:1201:12)\n' +
    '    at processTicksAndRejections (internal/process/task_queues.js:84:21)'
}
```

8. Account 0 ends the Auction:

```
truffle(ganache)> instance.auctionEnd({from: accounts[0]})
{
  tx: '0x09691028dd0e5435c3251d313fd3454d15a10af1f96699d0c59ab65e0e90f1bb',
  receipt: {
    transactionHash: '0x09691028dd0e5435c3251d313fd3454d15a10af1f96699d0c59ab65
e0e90f1bb',
    transactionIndex: 0,
    blockHash: '0x7a8858aaa43124c328c954feae46d7e8d57b2b99c4ade8f4be2479fbd45ec
133',
    blockNumber: 10,
    from: '0x45734f25fb1be104e0fa9cb71a38bd86e0b4353d',
    to: '0x91fdb3d54cff65589f932d4c67672e4bce18153d',
    gasUsed: 49920,
    cumulativeGasUsed: 49920,
    contractAddress:     ,
    logs: [],
    status: true,
    logsBloom: '0x00000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000',
    v: '0x1c',
    r: '0xfbb22f3551ee6936117a4d46c96f9e2743856130fa8f494aaf6fea58682851f4',
    s: '0x333c8fb5a9d2e8b0e4ef633fd9e7ed8f9c617ba8fbbe8c3249b66d2c63829ba6',
    rawLogs: []
  },
  logs: []
}
```

9. Check the balance of Account 0:

The balance of Account 0 increases to 114 ETH.

```
truffle(ganache)> let balance0 = await web3.eth.getBalance(accounts[0])
undefined
truffle(ganache)> balance0
'114985184120000000000'
```

The amount of gas or transaction fee:

1. The total cost of deploying the contract is 0.01243744 ETH.

```
jameswang@JamesdeMacBook-Pro hw1-source % truffle migrate

Compiling your contracts...
===========================
> Everything is up to date, there is nothing to compile.


Starting migrations...
======================
> Network name:    'ganache'
> Network id:      5777
> Block gas limit: 0x6691b7


1_initial_migration.js
======================

   Replacing 'Migrations'
   ----------------------
   > transaction hash:    0x2b30b3870cd1fc0f13b735abc404cb925a5834ee2357a981bc1
2590350e0780d
   > Blocks: 0            Seconds: 0
   > contract address:    0x8941907Ef1b4D41CB77713f9733C2272A8Cb2B5e
   > block number:        1
   > block timestamp:     1582130319
   > account:             0x45734f25fB1bE104e0fA9cB71A38bD86E0B4353D
   > balance:             99.99623034
   > gas used:            188483
   > gas price:           20 gwei
   > value sent:          0 ETH
   > total cost:          0.00376966 ETH


   > Saving migration to chain.
   > Saving artifacts
   -------------------------------------
   > Total cost:          0.00376966 ETH


2_deploy_contracts.js
=====================

   Replacing 'Auction'
   -------------------
   > transaction hash:    0xdaee187961bbb66ea52c4bff4cd498f997a8077e186a8a3fee2
33605d44e57db
   > Blocks: 0            Seconds: 0
   > contract address:    0x91fdB3D54CFF65589F932d4c67672E4Bce18153d
   > block number:        3
   > block timestamp:     1582130319
   > account:             0x45734f25fB1bE104e0fA9cB71A38bD86E0B4353D
   > balance:             99.98672254
   > gas used:            433389
   > gas price:           20 gwei
   > value sent:          0 ETH
   > total cost:          0.00866778 ETH


   > Saving migration to chain.
   > Saving artifacts
   -------------------------------------
   > Total cost:          0.00866778 ETH


Summary
=======
> Total deployments:   2
> Final cost:          0.01243744 ETH
```

2. The gas used by triggering the function bid() is 62142

```
truffle(ganache)> instance.bid({from: accounts[1], value: 1000000000000000000})
{
  tx: '0x9bd60c90307bf2d7cb408c85d262e855176a8cf15c20abefac8cc84a56bd06be',
  receipt: {
    transactionHash: '0x9bd60c90307bf2d7cb408c85d262e855176a8cf15c20abefac8cc84a
56bd06be',
    transactionIndex: 0,
    blockHash: '0xb66ae3dde15c9325ecdaba232bd8f4f864eb3f79223d4a96a4dd7fea44a321
b5',
    blockNumber: 5,
    from: '0xbff7b82a102a89375835cb69b3735c53a40f48aa',
    to: '0x91fdb3d54cff65589f932d4c67672e4bce18153d',
    gasUsed: 62142,
    cumulativeGasUsed: 62142,
    contractAddress:     ,
    logs: [],
    status: true,
    logsBloom: '0x00000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000',
    v: '0x1b',
    r: '0xc058f9929a67dd7bb98d1ac2113c829330e09b187835cd04509e0120e772eaa3',
    s: '0x2e628eaab3ba96d5e8c3c4e270b8ee634d1064cad6b48e559f852a81126556bf',
    rawLogs: []
  },
  logs: []
}
```

3. The gas used by triggering the function withdraw() is 19465.

```
truffle(ganache)> instance.withdraw({from: accounts[1]})
{
  tx: '0x6b5bb59c8ee0d3bf0a781e5d234f3e4b8e07bb2b022c6506eb97310392ae8efb',
  receipt: {
    transactionHash: '0x6b5bb59c8ee0d3bf0a781e5d234f3e4b8e07bb2b022c6506eb97310
392ae8efb',
    transactionIndex: 0,
    blockHash: '0xfb858bc645e7fa67c3e3f1f8bdd2abd4b59eeb44e64c9cfd58ec76c6143bf
2ba',
    blockNumber: 8,
    from: '0xbff7b82a102a89375835cb69b3735c53a40f48aa',
    to: '0x91fdb3d54cff65589f932d4c67672e4bce18153d',
    gasUsed: 19465,
    cumulativeGasUsed: 19465,
    contractAddress:     ,
    logs: [],
    status: true,
    logsBloom: '0x00000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000',
    v: '0x1b',
    r: '0xe046e1be79af292eb730def3d6e765aba18887001ee6cf78ad46b61759b250ba',
    s: '0x6119d95555d90d143e5beae571d2cf5b312df9a207a0316b27149e9cee39d4df',
    rawLogs: []
  },
  logs: []
}
```

4. The gas used by triggering the function auctionEnd() is 49920.

```
truffle(ganache)> instance.auctionEnd({from: accounts[0]})
{
  tx: '0x09691028dd0e5435c3251d313fd3454d15a10af1f96699d0c59ab65e0e90f1bb',
  receipt: {
    transactionHash: '0x09691028dd0e5435c3251d313fd3454d15a10af1f96699d0c59ab65
e0e90f1bb',
    transactionIndex: 0,
    blockHash: '0x7a8858aaa43124c328c954feae46d7e8d57b2b99c4ade8f4be2479fbd45ec
133',
    blockNumber: 10,
    from: '0x45734f25fb1be104e0fa9cb71a38bd86e0b4353d',
    to: '0x91fdb3d54cff65589f932d4c67672e4bce18153d',
    gasUsed: 49920,
    cumulativeGasUsed: 49920,
    contractAddress:     ,
    logs: [],
    status: true,
    logsBloom: '0x00000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000',
    v: '0x1c',
    r: '0xfbb22f3551ee6936117a4d46c96f9e2743856130fa8f494aaf6fea58682851f4',
    s: '0x333c8fb5a9d2e8b0e4ef633fd9e7ed8f9c617ba8fbbe8c3249b66d2c63829ba6',
    rawLogs: []
  },
  logs: []
}
```

5. The balance of beneficiary account before triggering the auctionEnd() is 99.98618252 ETH

```
truffle(ganache)> let balance0before = await web3.eth.getBalance(accounts[0])
undefined
truffle(ganache)> balance0before
'99986182520000000000'
```

6. The cost of triggering the auctionEnd() is 49920 * 2 * 10^{10} = 0.0009984 ETH

```
truffle(ganache)> instance.auctionEnd({from: accounts[0]})
{
  tx: '0x09691028dd0e5435c3251d313fd3454d15a10af1f96699d0c59ab65e0e90f1bb',
  receipt: {
    transactionHash: '0x09691028dd0e5435c3251d313fd3454d15a10af1f96699d0c59ab65
e0e90f1bb',
    transactionIndex: 0,
    blockHash: '0xceb5007b215225b0e59460d2e38ca5bddc987d1bc9ecbfda800d6316fb679
0e5',
    blockNumber: 6,
    from: '0x45734f25fb1be104e0fa9cb71a38bd86e0b4353d',
    to: '0x91fdb3d54cff65589f932d4c67672e4bce18153d',
    gasUsed: 49920,
    cumulativeGasUsed: 49920,
    contractAddress:     ,
    logs: [],
    status: true,
```

7. The balance after triggering the auctionEnd() should be 99.98618252(balance before) - 0.0009984(transaction fee) + 15(highest bid) = 114.98518412 ETH

```
truffle(ganache)> let balance0after = await web3.eth.getBalance(accounts[0])
undefined
truffle(ganache)> balance0after
'114985184120000000000'
```