DeFi Deep Dive

Week 1

1.

Question 1

DAI holds its value as a stablecoin because it is fully collateralized with physical U.S. dollars and the holdings are regularly audited.

1 / 1 point

True

False

Correct

DAI is a crypto-collateralized stablecoin, not a fiat collateralized stablecoin like USDC and USDT. There is no formal audit because anyone, anytime, can see the collateral (which is in the form of crypto pledged to a vault.

2.

Question 2

A user could use MakerDAO to make a leveraged bet on ETH by depositing ETH, minting DAI (which needs to be paid back) and using the DAI to purchase more ETH.

1 / 1 point

True

False

Correct

Indeed, this process could continue. The purchased ETH with the borrowed DAI could be deposited in MakerDAO and additional DAI could be minted and used to buy more ETH. Of course, the more leverage the riskier this is. While your gains are higher with leverage, your losses are also greater if ETH falls in value.

3.

Question 3

Borrowing in MakerDAO is an example of a collateralized debt obligation. The collateral is set to exactly match the value of the loan.

1 / 1 point

True

False

Correct
A CDO is like a mortgage and for the mortgage the loan amount is always less than the value of the collateral (when the mortgage is issued). House prices are relatively stable. Crypto prices like ETH are highly volatile. Hence, the collateralization rate is set high 150-200% of the value of the loan. This ensures that it is very unlikely the loan goes under water (meaning the value of the collateral is worth less than the loan obligation.

4.

Question 4
If the price of ETH drops, leading to an undercollateralization (meaning below the required collateralization), then the smart contract automatically closes out the loan (sells the collateral to pay back the loan).

1 / 1 point

True

False

Correct
This is not automatic. There are a number of things that could happen. First, the borrower could post more collateral just BEFORE the loan becomes undercollateralized. Second, and more likely, an externally owned address (EOA) will close the loan out (sell the collateral, pay back the loan, keep a fee and return any residual to the borrower). This EOA is known as a keeper which is a general term in the blockchain space for users that are incented to do things to keep the protocol healthy. In this case, we want to avoid undercollateralization because this would lead to lack of faith in the DAI stablecoin peg. If there is anything leftover in the vault after the keeper takes her reward, the excess funds are paid back to the original borrower.

5.

Question 5
In the case of a major drop in the value of ETH, MakerDAO has an additional mechanism to collect what is owed by the borrowers: the same type of collection agency used in traditional finance.

1 / 1 point

True

False

Correct
It is hard to send the collection agency when you don’t know the identity or the location of the borrower. There are two additional mechanisms. The first is Protocol Debt. Think of this as a buffer or insurance fund that is used if needed. If the drop is so great that this fund is exhausted, there is a

second method called Global Settlement. Here the holders of the governance token MKR are diluted. MKR is minted and sold to pay off the debt.

6.

Question 6

MKR governance tokens control the MakerDAO. They vote on proposals such as new types of collateral and changing parameters like collateralization ratios.

1 / 1 point

- (•) True
- ( ) False

Correct

In addition, they are incented to operate in the best interest of the DAO. If they do something like paying themselves a large dividend, then the community might abandon MakerDAO for a competing protocol - and the value of the MKR token would plunge.

7.

Question 7

A drawback of DAI is that the supply is limited by the demand for ETH- and ERC-20- collateralized debt.

1 / 1 point

- (•) True
- ( ) False

Correct

The fiat collateralized do not have this issue because there is plenty of USD. In the original DAI model, only ETH was accepted as collateral which severely restricted scale. However, today other ERC-20s can be used for collateral which mitigates the issue to some degree.

8.

Question 8

Given that DAI has so many levels of risk management, DAI’s pegged value will always be protected even in the scenario of a massive collapse in the collateral value.

1 / 1 point

- ( ) True
- (•) False

Correct
If there was a massive collapse, it is unclear that the value could be maintained. Global settlement relies on using the MKR governance token which would presumably also collapse in value. Hence, the stablecoin is not risk free.

9.

Question 9
In Compound, the collateralization ratio is calculated as 100 divided by the weighted sum of the asset collateralization factors.

1 / 1 point

- (•) True
- ( ) False

Correct
Collateralization factors range from zero (cannot be used) to 90 (very safe like a stablecoin). The ratio is 100 divided by the weighted sum of the factors where the weights are just the proportions of the collateral expressed in a common currency.

10.

Question 10
In Compound, the borrow rate is usually an increasing function where the y-intercept is the base rate and the slope represents the change in rates. These parameters are identical for every ERC-20 token.

1 / 1 point

- ( ) True
- (•) False

Correct
The first statement is true. However, the slope and the intercept generally depend on the ERC-20 token.

11.

Question 11
In Compound, the borrow rate is always less than the supply rate.

1 / 1 point

- ( ) True
- (•)

False

Correct
Even in traditional banking, the borrowing rates are always higher than savings rates. The supply rates are determined by the borrow rate times the utilization rate where the utilization rate is the proportion of the total amount of supply that is lent out.

12.

Question 12
A reserve factor is set aside from the borrower revenue to cover a situation where a borrower might default.

1 / 1 point

True

False

Correct
The reserve factor is a percentage of the borrow payment that is held just in case there is a default. The reserve factor does not impact the borrow rate. However, the reserve factor reduces the supply rate because less revenue is available to distribute.

13.

Question 13
Compound can be used to bet that the prices of ETH will decrease by doing the following: Step 1: deposit stable coin; Step 2: borrow ETH; and Step 3: sell ETH for stablecoin.

1 / 1 point

True

False

Correct
If the price of ETH falls, you can use your stablecoin to buy cheaper ETH and pay off the loan with a profit. Notice, that you can easily take a levered position by adding a step d) deposit additional stablecoin; e) borrow additional ETH; and f) sell ETH for stablecoin.

14.

Question 14
Compounds c-tokens represent the users share in the liquidity pool.

1 / 1 point

True

False

Correct
When you add to a liquidity pool, c-tokens are minted. They represent your share in the pool. They can be redeployed or sold as separate assets. When you redeem from the liquidity pool, you c-token is burned.

15.
Question 15
Compound became fully decentralized when the COMP governance tokens were given to users of the platform and additional COMP continue to be distributed to users as an incentive to use the platform.

1 / 1 point

True

False

Correct
In traditional finance, this is similar to Apple distributing its stock to those that buy Apple products. Note the c-tokens like c-DAI are equity tokens. COMP is the governance token.

16.
Question 16
One disadvantage of Compound is that the c-tokens are specialized to Compound’s protocol and can only be used in that protocol.

1 / 1 point

True

False

Correct
The c-tokens are just ERC-20 tokens. They can be used essentially anywhere in the DeFi ecosystem. I referred to this as DeFi Legos. One big advantage of DeFi is its immediate interoperability.

17.
Question 17
Flash loans can be used to refinance borrowing to take advantage of the lowest interest rate that is offered.

1 / 1 point

True

False

Correct
One way to refinance is to payback the original loan and then refinance at the lower rate. A flash loan is designed to do this in one transaction (with multiple steps in the transaction).

18.

Question 18
One disadvantage of flash loans is that in the transaction (with many steps) is the following: if there is a problem with one of the steps, you could lose your capital.

1 / 1 point

True

False

Correct
Flash loans are atomic transactions. If any step in the process fails, we automatically revert to the original state. All that is lost is the gas fee.

19.

Question 19
One advantage of Aave is that they offer a loan with a guaranteed fixed rate.

1 / 1 point

True

False

Correct
They offer stable rate loans which is different from a fixed rate in TradFi. There are conditions where the stable rate can change.

20.

Question 20
Credit delegation in Aave brings trustless uncollateralized or undercollateralized lending to DeFi.

1 / 1 point

True

False

Correct
First, the loans are overcollateralized, always. Someone needs to pledge the collateral. Second, you need to trust the person that you are posting the collateral for. This happens outside the world of DeFi. Nevertheless, this is a significant innovation because it allows for some to borrow on an uncollateralized basis - with a sponsor effectively “co-signing” the loan.

Week 2

1.
Question 1

In a constant product automated market maker, the invariant is the product of the number of tokens in the pool for token A and token B.

1 / 1 point

True

False

Correct

The key is the number of tokens and in the Uni v2, the initial allocation of liquidity will be an equal value of the two tokens.

2.
Question 2

To purchase token A from the AMM, a user needs to deposit token B and then withdraw token A.

1 / 1 point

True

False

Correct

This is exactly how it works. You want to exchange B for A. You deposit B and get A. Given the invariant, this will cause B to go down in price and A to go up. Intuitively, you are adding to the supply of B (making it more plentiful will decrease prices) and you are buying B which bids the price up.

3.
Question 3

One drawback of the AMMs are the limited trading hours (currently 9:30am to 4:00pm Eastern Time).

1 / 1 point

True

False

Correct

The 9:30am to 4:00pm are the trading hours for the New York Stock Exchange. AMMs can be used at any time of the day. There is no “open” and “close”.

4.
Question 4

Smaller invariants mean more liquidity in the pool.

0 / 1 point

True

False

Incorrect

The invariant is just the product of the number of each coin in the pool. Higher invariants mean more tokens and more tokens means more liquidity. The higher the liquidity the less of an impact on price for a trade.

5.

Question 5

The higher the correlation of the pair of assets in a liquidity pool - the higher the impermanent loss.

1 / 1 point

True

False

Correct

Higher correlation tokens means there are smaller deviations in relative value hence minimizing the impermanent loss.

6.

Question 6

Given there is almost always an impermanent loss, AMMs will eventually disappear because no one will supply liquidity when you know you will lose money.

1 / 1 point

True

False

Correct

It is true that there is almost always impermanent loss (that is the extra money you would have made if you did not put tokens in AMM - the opportunity cost. However, this ignores the passive income. The liquidity providers earn an income when trades occur. The more trading the more income. This income is usually greater than the impermanent loss. If the income was always less than the impermanent loss, that would be a problem for AMMs.

7.

Question 7

In contrast to other DeFi applications, AMMs are immune to users trying to front-run trades.

0 / 1 point

True

False

Incorrect

Front-running is a significant problem. Remember the front-running is legal in the context of DeFi. Given a candidate transaction is visible to anyone in the memory pool, a miner might post a high priority fee and trade ahead of the transaction (e.g., buy before a large buy that will drive the price up) and then immediately trade out of the position. This only works if the miner wins the block.

8.
Question 8

A flash swap is the same as a flash loan.

1 / 1 point

True

False

Correct

It is similar but not the same. A swap in an exchange. It is similar in that it occurs in the same transaction (which has multiple steps). In a flash loan, you payback the loan in the same token that you borrowed. In the example in the lecture, we do a flash swap for USDC but close the swap with DAI.

9.
Question 9

Both flash swaps and flash loans require full collateralization.

1 / 1 point

True

False

Correct

One of the key features of flash loans and swaps is the absence of collateral. There is no counterparty risk because if the loan is not paid back the entire transaction fails and we revert to the state before the loan.

10.
Question 10

The key innovation in Uniswap v3 is that liquidity providers can allocate funds to a custom range of prices.

1 / 1 point

True

False

Correct

This innovation is important because it makes v3 more like a limit order system. In practice, all of the liquidity is aggregated and the user of the AMM deals with the aggregate. Essentially, the liquidity providers have individualized price curves but the users are faced with a single book.

11.
Question 11

Balancer generalizes the idea of Uniswap so that more than two tokens can be supported in a liquidity pool and the amounts of value need not be the same for each token.

1 / 1 point

True

False

Correct

In Uniswap v2, we have a simple expression, k=x*y. With balancer with equal values to three assets, it would be k=x*y*z. If there is an unequal value among x, y, and z, an exponent is applied to each term representing the normalized weight.

12.
Question 12

Hypothecation simply means pledging collateral.

1 / 1 point

True

False

Correct

When you borrow, you almost always need to post collateral. For example, in CeFi, we might pledge a house to take out a mortgage.

13.
Question 13

Rehypothecation refers to the situation where the collateral is returned to the borrower when the loan is paid off.

1 / 1 point

True

False

Correct

Rehypothecation, in CeFi, is where assets posted by clients are reused as collateral for their own trading. It is sometimes called repledging. Think of a bank pledging as collateral demand deposits. In DeFi, this can happen when an equity token is used for collateral for additional borrowing.

14.
Question 14

Total locked value refers to funds that are trapped forever in liquidity pools.

1 / 1 point

True

False

Correct

The lock is misleading because the funds can be repatriated at any time. It refers to the funds in liquidity pools.

15.
Question 15

Rehypothecation leads to an understatement of total locked value.

0 / 1 point

True

False

Incorrect

It leads to an overstatement. I could add liquidity to a pool and then get an equity token that represents my share. I could use that equity token and deposit into another pool. The same initial funding is being counted twice. This is commonplace in CeFi and sometimes called the money-multiplier effect.

Week 3

1.
Question 1

The Yield Protocol provides a way to do fixed rate investing and borrowing.

1 / 1 point

True

False

Correct

This is the key innovation. The current DeFi protocols have variable rates. The borrowing is at a floating rate and that is also true for the suppliers. Yield provides a method to lock in a fixed rate of return.

2.
Question 2

During the lecture we talked about the mechanics of a fixed rate 8.7% loan. The following steps approximately describe the loan (assume 1 ETH = 200 DAI). 1. Supply 1 ETH to Protocol as collateral and mint 100 yDAI; 2) Sell 100 yDAI to the buyer and receive 92 DAI; 3) In one year, buyer deposits 100 yDAI and receives 100 DAI. The rate of return for the buyer is 100/92 - 1 = 8.7%.

1 / 1 point

- (•) True
- ( ) False

Correct

This accurately describes the mechanics but we are ignoring all fees including gas. The borrower pays exactly 8.7%. They get 92 DAI today and pay 100 DAI in one year. The supplier gets 8.7%.

3.
Question 3

In the Protocol and continuing the lecture example, if the price of ETH falls below the maintenance point (but the collateral is still worth more than the loan), the contract will be closed out and the supplier of capital will fail to get their 8.7% return.

1 / 1 point

- ( ) True
- (•) False

Correct

If after the first month, the price of ETH drops and a liquidation is triggered, the following happens. The keeper will sell the collateral (ETH) and pay back the supplier 100 DAI. Any residual collateral (after keeper fees) is returned to the borrower. The supplier (or buyer) gets paid off early. This means that they earned 8.7% in one month - not one year. The annualized rate of return is much greater than 8.7%.

4.
Question 4

dYdX is a decentralized derivatives exchange where all orders (bids and asks) are on-chain which is enormously expensive because of gas fees.

1 / 1 point

True

False

Correct

dYdX has a hybrid approach. The orders are kept off-chain in a multisignature wallet. Only when the orders are matched is there an on-chain transaction. Hence, this minimizes the gas fees.

5.
Question 5

It is possible to utilize dYdX's free flash loans to do cross-DEX arbitrage.

1 / 1 point

True

False

Correct

We went through a detailed example where a free flash loan was initiative on dYdX for DAI, some ETH were purchased with the DAI on Uniswap, use some of the ETH to buy DAI on dYdX, repay the flash loan and pocket the profit in ETH.

6.
Question 6

Perpetual futures are identical to CeFi futures contracts with long-dated expirations, say 10 years.

1 / 1 point

True

False

Correct

There is no expiration in perpetual futures. The perpetual futures are a bet on the price movement. You are long if you think the asset will appreciate and short if you think it will depreciate.

7.
Question 7

The funding rate in a perpetual futures contract is the interest that you collect on the collateral deposit that you make.

0 / 1 point

True

False

Incorrect

In the perpetual futures, there is an index that delivers the spot price. That index is derived through an oracle. The funding rate keeps the futures price close to the index. If the futures is trading above the index, the funding rate is positive and the longs pay the shorts. If the futures is trading below the index, the funding rate is negative and the shorts pays the longs.

8.
Question 8

Futures contracts are equivalent to options where the long futures is analogous to a call option (you make money when the price goes up) and the short futures is analogous to a put option (you make money when the price goes down).

0 / 1 point

True

False

Incorrect

Futures and options are fundamentally different. If you hold a call option (which gives you the right to buy the asset at a set price) and the price of the underlying asset goes down, there is no obligation to exercise the option (why buy the asset for a price higher than you can get it in the open market). You just let it expire. So with options there is a payoff in one direction and if the price goes against you, you just lose the value of the option. In contrast, futures are obligations. If the price goes against you, funds are subtracted from your margin account. So options are one-sided - and that is the reason that you pay a premium to buy an option. Futures are two-sided - and that is the reason there is no premium (or cost) for entering into a futures contract whether a TradFi contract or a DeFi contract.

9.
Question 9

Synths are tokens whose prices are pegged to an underlying price feed and are backed by collateral. The s-tokens represent long positions and the i-tokens represent the inverse (like a short position).

1 / 1 point

True

False

Correct

The price feeds come from Chainlink's oracles. It is possible to track any asset such as fiat currencies, cryptos, commodities, and equities.

10.
Question 10

In any Synthetix position, the trader is effectively "long" her personal portfolio against the entire pool's portfolio.

1 / 1 point

True

False

Correct

In the lecture, we reviewed the mechanics of this where three traders deposited sBTC, sETH and sUSD into a pool in equal amounts. We saw that the price movements of the three underlying assets

determined who would be better off or worse off. In the example, the portfolios were simple in that the first trader held a single asset sBTC, the second, sETH and the third sUSD.

Week 4

1.
Question 1

Set Protocol combines tokens from different blockchains (e.g., ETH and BTC) into a composite token.

1 / 1 point

True

False

Correct

Set is not a cross-chain platform. Yes, tokens are combined but they are combined in the Ethereum blockchain.

2.
Question 2

In a static set, tokens are a fixed bundled set of tokens, e.g., 50% USDC and 50% DAI would be a static stablecoin set.

1 / 1 point

True

False

Correct

There is no active trading in a static set. They are analogous to a passive ETF (though a passive ETF is more complicated because of dividends and stocks dropping in and out of the target index).

3.

Question 3

In dynamic sets, a trading strategy can be hard coded into the set, such as a moving average rule.

1 / 1 point

True

False

Correct

We discuss one simple rule where the set would switch dynamically from 100% ETH to 100% USDC based on a trigger in terms of the x-day moving average.

4.

Question 4

An advantage of active Sets compared to ETFs is that there are no fees with Sets.

1 / 1 point

True

False

Correct

There are fees and we discussed many ways to do the fees: front-end load, management fixed fee (say X% per year) and performance fee (percentage of the profits go to the creator).

5.

Question 5

It is possible to set up a discretionary Set where the creator has discretion over the sizes of positions thus enabling social trading.

1 / 1 point

True

False

Correct

This is very similar to investing in an active mutual fund or a hedge fund. The difference is that it is available to anyone (in certain countries).

6.
Question 6

Active sets are likely securities.

1 / 1 point

True

False

Correct

They operate like ETFs or hedge funds so they appear to be securities in the US. Hence, these Sets are not available to US persons.

7.
Question 7

Wrapped bitcoin is a method to collateralize (off chain) with bitcoin and mint an ERC-20 token to deploy in DeFi.

1 / 1 point

True

False

Correct

In a similar way, USDC is collateralized with US dollars and other assets off-chain.

8.
Question 8

When Ethereum moves to Proof of Stake consensus, this will cause a problem for wrapped bitcoin because bitcoin will still be using Proof of Work consensus.

1 / 1 point

True

False

Correct

Currently both Ethereum and Bitcoin use Proof of Work. If Ethereum moves to Proof of Stake, that is irrelevant for wBTC. The consensus mechanism is the framework whereby new blocks are added to a blockchain. The mechanism in Ethereum does not impact the smart contracting features which are essential for the creation of wBTC.

9.
Question 9

The DAO that controls the multisignature wallet for wBTC uses a governance token so it is fully decentralized.

1 / 1 point

True

False

Correct

Currently there is no governance token. There are a set of owners with a maximum of 50. While this is not fully decentralized, it is close. Notice there is a big difference between this and USDC which is a centralized crypto. There is a company behind USDC and we rely on audits to figure out if USDC has the collateral that backs their stablecoin. The advantage of wBTC is that the BTC is virtual not physical and can be kept in a multisig wallet.

10.
Question 10

Wrapped ETH is an example of a centralized cryptocurrency, like USDC.

1 / 1 point

True

False

Correct

It is completely decentralized. It is just a smart contract. In contrast to wBTC, wETH is 100% on the Ethereum blockchain. wETH exists because of a short-coming in ERC-20 where all the ERC-20 tokens are interoperable but ETH is not an ERC-20 token. This will likely be fixed in the future and wETH will disappear.