1. (10 points) Of the following statements, identify all that hold about this e-business

    A. To build a modern XML-based system, the main set of APIs we need is for an XML parser

    B. Three main abstractions underlying modern information systems are tags, trees, and templates

    C. Three main abstractions underlying modern information systems are documents, objects, and tuples

    D. Within an enterprise, sociopolitical reasons are the only motivation for assuming autonomy

    E. Within an enterprise, historical reasons are the main motivation for assuming heterogeneity

> **Solution:** C and E
>
> D is false because technical reasons for autonomy are more important within an enterprise

2. (a) (10 points) Of the following statements, identify all that are true about prices:

    A. Prices cannot be negative to preserve the soundness of properties on rationality

    B. Prices cannot be negative to preserve individual rationality for sellers

    C. Prices cannot be zero to prevent divide-by-zero errors in correctness theorems about markets

    D. Assuming enough bids were available, if in the McAfee auction we computed the price as the average of the $(M-1)^{st}$ and $(M+2)^{nd}$, the resulting auction would be less efficient than the traditional McAfee auction

    E. It would be acceptable to define a dual price auction whose price was *equal* to the Mth price and any seller or buyer bidding at exactly the Mth price was not allowed to trade

> **Solution:** B, D, E
>
> Assumes the goods are desirable (positive valuations). If you are trying to "sell" your trash, you may have to pay someone to haul it away, but that's not the kind of sale we have considered.

(b) (10 points) Of the following statements, identify all that are true about markets:

    A. A market ensures a Pareto optimal allocation of resources

    B. An agent may end up with the worst possible allocation according to its preferences even though the allocation of resources is Pareto optimal

    C. An agent may prefer one Pareto optimal allocation to another Pareto optimal allocation of the same resources in the same conditions

    D. An endogenous market can ensure that supply equals demand whereas an exogenous market cannot make such guarantees

    E. A glaring shortcoming of incentive compatibility analyses is that they assume autonomous agents would be happy paying or receiving other people's prices

> **Solution:**
>
> B, C
>
> D is false because whether a market ensures supply equals demand depends on whether it computes equilibrium prices; the difference between endogenous and exogenous markets is irrelevant
>
> Note that A is false in general: markets, e.g., as McAfee auctions, need not be efficient

(c) (10 points) Consider an auction scheme for selling a single item where

- The highest buy bidder wins if the highest buy bid exceeds the sell bid
- The price of the transaction equals the second highest bid plus $1

Of the following statements, identify all that are true (assume that there are always two or more buy bids and that there is never a tie for the highest buy bid).

    A. This auction is budget balanced

    B. This auction is incentive compatible for buyers

    C. This auction is incentive compatible for sellers because it finds a price closer to the Mth price

    D. Assuming that sellers and buyers bid according to their true valuations, this auction yields a Pareto optimal allocation of resources

    E. Assuming that sellers and buyers bid according to their true valuations, this auction guarantees individual rationality for buyers

> **Solution:** A, B, D
>
> C is false because the seller's payoff can depend on the seller's bid (i.e., if that is the second highest bid)
>
> E is false because the winning buyer may pay more than his valuation

(d) (10 points) Of the following statements, identify all that are true about the concepts of rationality discussed in class:

    A. Given the utility function for an agent, we can determine a unique preference relation for that agent

    B. Given the preference relation for an agent, we can determine a unique utility function for that agent

    C. Utility theory proves the law of diminishing returns

    D. If you are indifferent between A and B and prefer A to C, then you must prefer B to C

    E. If a risk averse agent prefers a lottery L_1 to a lottery L_2, then L_1 must be a really good deal: that is, a risk neutral agent would also prefer L_1 to L_2

> **Solution:** A, D
>
> E is false because the lack of risk in L_1 is what might attract the risk averse agent, even if L_1 has a lower expected payoff than L_2