This homework assignment has 3 problems, for a total of 40 points.

1. (10 points) Identify all of the following statements that are true about the basics of services.
   A. The Basic Profile 1.0 is a standard that specifies which standards to use for interoperable web services
   B. We should adopt object-oriented design approaches for service-oriented systems because do so yields services at a fine granularity
   C. When we model legacy applications as services, we can end up with services viewed at an undesirably coarse granularity
   D. A technical requirement resulting from supporting revisions is that the services involved be sufficiently long-lived both to provide revisions and to consume revisions provided by others
   E. Asynchronous communications promote loose coupling and thus are unsuited for open environments

2. (4 points) Consider a value map between the set of letters, \( a = \{ A \ldots Z \} \) (sorted with \( A \) as lowest and \( Z \) as highest) to the set of integers, \( b = \{ 1 \ldots 5 \} \). As usual, we consider the value map as two functions, \( m_{ab} \) and \( m_{ba} \). Let \( m_{ab} \) map \( A, B, C, D \) to \( 1, 2, 3, 4 \) (respectively), and map all the letters \( \{ E \ldots Z \} \) to \( 5 \).
   A. \( m_{ba} \) is necessarily order preserving
   B. If \( m_{ab} \) is consistently inverting, \( m_{ba} \) must map the number 5 to one of the letters \( \{ E \ldots Z \} \)

3. (26 points) Identify all of the following statements that are true about knowledge modeling, RDF, and OWL
   A. An articulation axiom describes how concepts in one ontology map to concepts in another ontology
   B. A desirable property of a conceptualization is that it be elaboration tolerant
   C. Logic-based conceptualizations make it difficult to perform reasoning about whatever they represent
   D. In a well-formed RDF document, the domain and range of each property must be explicitly listed
   E. If we declare a resource as an instance of a class, e.g., via \( \langle \text{Building} \text{ rdf:ID='MRC'} \rangle \), then the resource is of \( \text{rdf:type} \) of the class, e.g., the resource named MRC has \( \text{rdf:type} \) equal to Building
   F. An RDF model naturally corresponds to a graph whose vertices correspond to resources and literals, and whose edges correspond to properties
   G. In RDF, we can capture a two-party relationship with an attribute (on the relationship) via an association entity represented as a resource
   H. Reification in RDF is sometimes shown pictorially with an ellipse for a statement surrounding a triple; thus reification represents a situation where an RDF model does not correspond to a graph
   I. We can use RDF Schema to define a custom vocabulary that our instance documents can use to specify models of particular web resources
   J. If we assert that medico is a superclass of physician, then we can send in a medico for a service (medical procedure) that requires a physician
   K. Consider that we have defined two classes, Person and Parent and properties hasParent and parentOf in OWL; then, it is impossible to assert that Person is a subclass of Parent
   L. In OWL, it is possible to define two classes, Foo and Bar, and assert that Foo is a subclass of Bar and Bar is a subclass of Foo
   M. In OWL, subclass is a transitive property