CS-171, Intro to A.I. — Quiz#4 — Winter Quarter, 2012 — 20 minutes

YOUR NAME AND EMAIL ADDRESS: _____

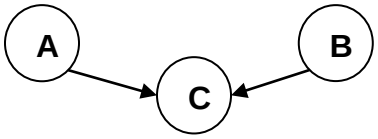
YOUR ID: _____ ID TO RIGHT: _____ ROW: _____ NO. FROM RIGHT: _____

1. (30 pts total, 2 pts each) Machine Learning concepts.
For each of the following items on the left, write in the letter corresponding to the best answer or the correct definition on the right. The first one is done for you as an example.

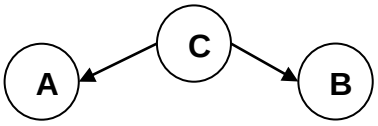
A .	Learning	A	Improves performance of future tasks after observing the world
	Information Gain	B	Fixed set, list, or vector of features/attributes paired with a value
	Decision Boundary	C	Agent learns patterns in the input with no explicit feedback
	Support Vector Machine	D	Agent observes input-output pairs & learns to map input to output
	Cross-validation	E	Example input-output pairs, from which to discover a hypothesis
	Linear Classifier	F	Examples distinct from training set, used to estimate accuracy
	Factored Representation (Feature Vector)	G	Supervised learning with a discrete set of possible output values
	Supervised Learning	H	Supervised learning with numeric output values
	Test Set	I	Internal nodes test a value of an attribute, leaf nodes=class labels
	Naïve Bayes Classifier	J	Expected reduction in entropy from testing an attribute value
	Classification	K	Choose an over-complex model based on irrelevant data patterns
	Decision Tree	L	Randomly split the data into a training set and a test set
	Regression	M	Surface in a high-dimensional space that separates the classes
	Training Set	N	Tests $\mathbf{w}\cdot\mathbf{f}>0$, where **w** is a weight vector and **f** is a feature vector
	Unsupervised Learning	O	Tests $P(C)\ \Pi_i\ P(X_i \mid C)$, where C is a class label and X_i are features
	Overfitting	P	Current most-popular "off-the-shelf" supervised learning method

2. (30 pts total, 10 pts each) Bayesian networks.
For each Bayesian network shown below, write down in factored form the joint probability distribution that it represents.

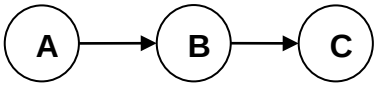
2a. _____



2b. _____



2c. _____



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2. (25 pts total) Decision Tree Learning.
You are an agricultural robot given the following set of plant examples. Each is assigned a class label of + or — depending on whether or not it is a member of the target class:

Example	Vine?	Fruit?	Leaf?	Class
Watermelon	Yes	Yes	Curly	+
Ivy	Yes	No	Curly	—
Bougainvillea	Yes	No	Flat	—
Kudzu	Yes	No	Flat	—
Maple	No	No	Curly	+
Oak	No	No	Flat	+
Sycamore	No	No	Flat	+
Apple	No	Yes	Curly	—

2a. (15 pts) Draw the decision tree that would be constructed by recursively applying information gain to select roots of sub-trees, as in the Decision-Tree-Learning algorithm.

2b. (5 pts) What class is Grape? (Vine=Yes, Fruit=Yes, Leaf=Curly)_____

2c. (5 pt) What class is Orange? (Vine=No, Fruit=Yes, Leaf=Curly)_____

4. (10 pts total) Bayesian networks.
Draw the Bayesian network that represents P(J | A) P(M | A) P(A | B, E) P(B) P(E).