For each question on Quiz #2, "Zero" gives the percentage of students who received zero, "Partial" gives the percentage who received partial credit, and "Full" gives the percentage who received 100%. (Due to rounding, numbers shown below are only an approximate estimate.)

Problem 1:
full credit: ~93% (~71 students)
partial credit: ~7% (~5 students)
zero credit: ~0% (~0 students)

Problem 2:
full credit: ~34% (~26 students)
partial credit: ~37% ~28 students)
zero credit: ~29% (~22 students)

Problem 3:
full credit: ~25% (~19 students)
partial credit: ~75% (~57 students)
zero credit: ~0% (~0 students)

CS-171, Intro to A.I. — Quiz#2 — Winter Quarter, 2015 — 20 minutes

YOUR NAME AND EMAIL ADDRESS: _____

YOUR ID: _____ ID TO RIGHT: _____ ROW: _____ SEAT: _____

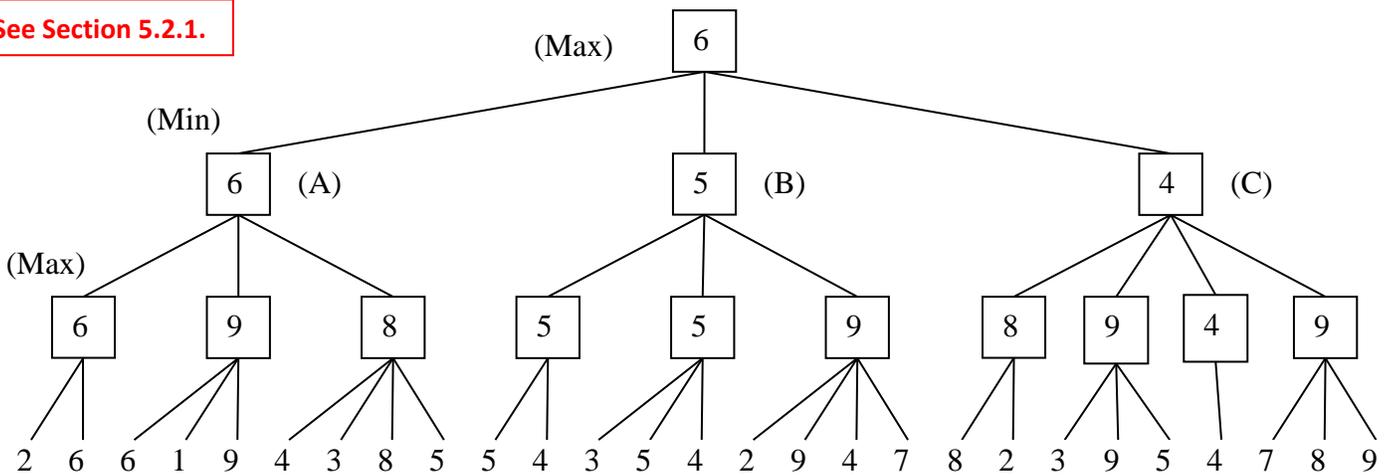**1. (25 pts total, -5 pts for each error, but not negative) MINI-MAX SEARCH IN GAME TREES.**
The game tree below illustrates a position reached in the game. Process the tree left-to-right. It is **Max**'s turn to move. At each leaf node is the estimated score returned by the heuristic static evaluator.

1.a. Fill in each blank square with the proper mini-max search value.

1.b. What is the best move for Max? (write A, B, or C) ___A___

1.c. What score does Max expect to achieve? _____6_____

See Section 5.2.1.

(Max) 6

(Min)   6 (A)   5 (B)   4 (C)

(Max)   6   9   8   5   5   9   8   9   4   9

2 6 6 1 9 4 3 8 5   5 4 3 5 4 2 9 4 7   8 2 3 9 5 4 7 8 9
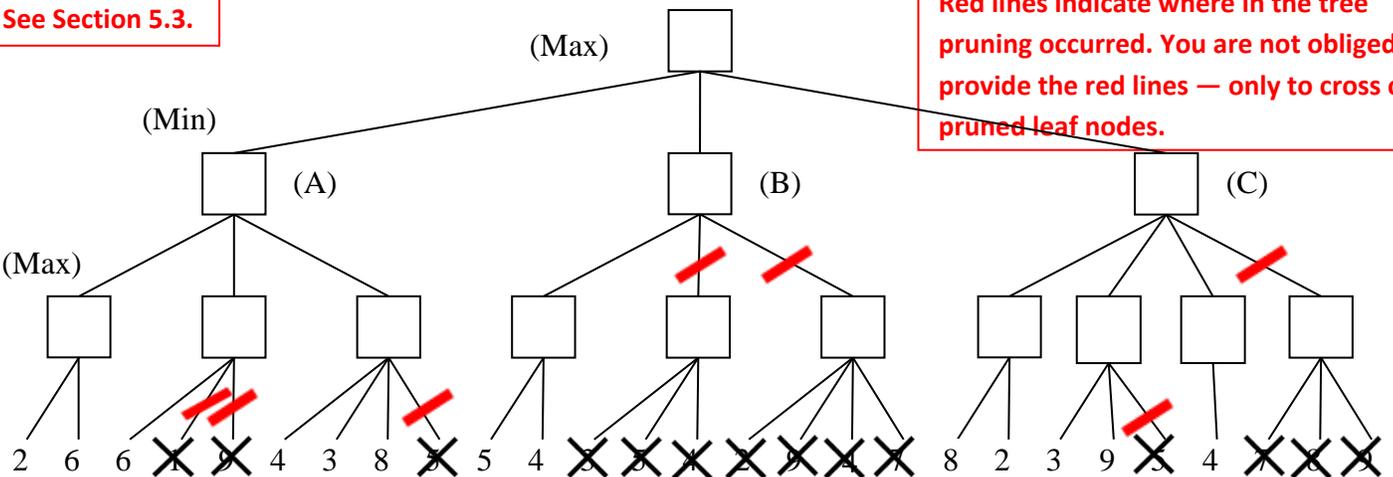
2. (25 pts total, -5 for each error, but not negative) ALPHA-BETA PRUNING. Process the tree left-to-right. This is the same tree as above (1.a). You do not need to indicate the branch node values again.
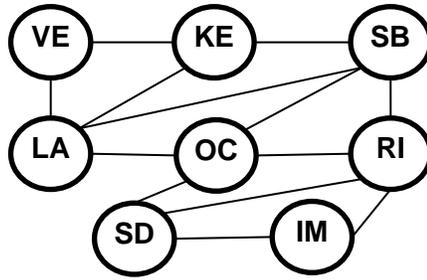
Cross out each leaf node that will be pruned by Alpha-Beta Pruning.

See Section 5.3.

Red lines indicate where in the tree pruning occurred. You are not obliged to provide the red lines — only to cross out pruned leaf nodes.

(Max) □

(Min)   □ (A)   □ (B)   □ (C)

(Max)   □ □ □   □ □ □   □ □ □ □

2 6 6 1̶ 9̶ 4 3 8 5̶ 5 4 3̶ 5̶ 4̶ 2̶ 9̶ 4̶ 7̶ 8 2 3 9 5̶ 4 7̶ 8̶ 9̶

**** TURN PAGE OVER AND CONTINUE ON THE OTHER SIDE ****

3. (50 points each, 10 pts each) Constraint Satisfaction Problems

IM = Imperial
KE = Kern
LA = Los Angeles
OC = Orange
RI = Riverside
SB = San Bernardino
SD = San Diego
VE = Ventura

You are a map-coloring robot assigned to color this map of Southern California counties. Adjacent regions must be colored a different color (R=Red, B=Blue, G=Green). The constraint graph is shown.

3a. (10 pts total, -5 each wrong answer, but not negative) FORWARD CHECKING. assigned value B, as shown. Cross out all values that would be eliminated by Forward Checking.

IM	KE	LA	OC	RI	SB	SD	VE
R G B	R G ~~B~~	B	R G ~~B~~	R G B	R G ~~B~~	R G B	R G ~~B~~

3b. (10 pts total, -5 each wrong answer, but not negative) ARC CONSISTENCY.
LA has been assigned B and OC has been assigned R, as shown; but no constraint been done. Cross out all values that would be eliminated by Arc Consistency (AC-3 in your book).

IM	KE	LA	OC	RI	SB	SD	VE
R ~~G~~ ~~B~~	R ~~G~~ ~~B~~	B	R	~~R~~ ~~G~~ B	~~R~~ G ~~B~~	~~R~~ G ~~B~~	~~R~~ G ~~B~~

3c. (10 pts total, -5 each wrong answer, but not negative) MINIMUM-REMAINING-VALUES HEURISTIC. Consider the assignment below. RI has been assigned B and constraint propagation has been done, as shown. List all unassigned variables (in any order) that might be selected now by the Minimum-Remaining-Values (MRV) Heuristic: ____**IM, OC, SB, SD**____.

IM	KE	LA	OC	RI	SB	SD	VE
R G	R G B	R G B	R G	B	R G	R G	R G B

3d. (10 pts total, -5 each wrong answer, but not negative) DEGREE HEURISTIC. Consider the assignment below. (It is the same assignment as in problem 3c above.) RI has been assigned B and constraint propagation has been done, as shown. Ignoring the MRV heuristic, list all unassigned variables (in any order) that might be selected now by the Degree Heuristic (DH) ____**LA**____.

IM	KE	LA	OC	RI	SB	SD	VE
R G	R G B	R G B	R G	B	R G	R G	R G B

3e. (10 pts total) MIN-CONFLICTS HEURISTIC. Consider the complete but inconsistent assignment below. SD has been selected to be assigned a new value (its old value was replaced by "?"). What new value would be chosen below for SD by the Min-Conflicts Heuristic? ____**G**____.

IM	KE	LA	OC	RI	SB	SD	VE
R	R	B	R	B	G	?	R