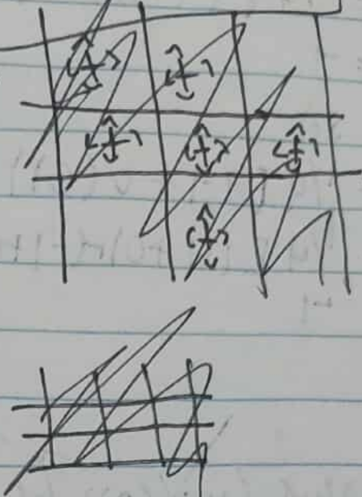
	VK(s)	VK+1(s)	VK+2(s)
A	0	-1	-2
B	0	-1	-1.75
~~C~~			
D	0	-1	-1.757
E	0	-1	-2
F	0	-1	-1.5
H	0	-1	-1.5

-1	-1	0
-1	-1	-1
0	-1	0



Step 1

1.) $V_{k+1}(A) = \frac{1}{4}[(-1+v(A)) + (-1+v(B)) + (-1+v(D)) + (-1+v(A))]$

$V_{k+1}(A) = \frac{1}{4}[(-1+0) + (-1+0) + (-1+0) + (-1+0)]$

$V_{k+1}(A) = -1$

2.) $V_{k+1}(B) = \frac{1}{4}[(-1+v(A)) + (-1+v(B)) + (-1+v(E)) + (-1+v(B))]$

$V_{k+1}(B) = \frac{1}{4}[(-1+0) + (-1+0) + (-1+0) + (-1+0)]$

$V_{k+1}(B) = -1$

3.) $V_{k+1}(D) = \frac{1}{4}[(-1+v(D)) + (-1+v(E)) + (-1+v(G)) + (-1+v(D))]$

$V_{k+1}(D) = \frac{1}{4}[(-1+0) + (-1+0) + (-1+0) + (-1+0)]$

$V_{k+1}(D) = -1$

NO:

DATE:

4.)
$V_{k+1}(F) = 1/4\,[(-1 + V(E)) + (-1 + V(F)) + (-1 + V(1)) + (-1 + V(C))$

$V_{k+1}(F) = 1/4\,[(-1+0) + (-1+0) + (-1+0) + (-1+0)$

$V_{k+1}(F) = -1$

5.)
$V_{k+1}(H) = 1/4\,[(-1 + V(G)) + (-1+V(1)) + (-1 V(H)) + (-1 + V(E))$

$V_{k+1}(H) = 1/4\,[(-1+0)+(-1+0) + (-1+0) + (-1+0)$

$V_{k+1}(H) = -1$

$V_{k+1}(C) = 1/4\,[(-1+0) + (-1+0) + (-1+0) + (-1+0)$

$V_{k+1}(C) = -1$

6.)
$V_{k+1}(E) = 1/4\,[(-1 + (D)) + (-1+V(F)) + (-1+V(G)) + (-1+V(B))$

$V_{k+1}(E) = 1/4\,[(-1+0) + (-1+0) + (-1+0) + (-1+0)$

$V_{k+1}(E) = -1$

8.) $q_{k+1}(A, \text{LEFT}) =$

$q(A, \text{LEFT}) = -1 + V(A)$

$= -1 + (-1)$

$q(A, \text{LEFT}) = -2$

9.) $q_{k+1}(A, \text{RIGHT}) =$

$q(A, \text{RIGHT}) = -1 + V(B)$

$= -1 + (-1)$

$q(A, \text{RIGHT}) = -2$

VALIANT

10.) $q_{k+1}(A, UP)$
$= -1 + V(A)$
$= -1 + V(-1)$
$q(A, UP) = -2$

11.) $q_{k+1}(A, DOWN)$
$= -1 + V(D)$
$= -1 + (-1)$
$= -2$

12. $\pi_{k+1}(A) =$ LEFT, RIGHT, UP, DOWN

A, LEFT $= -2$
A, RIGHT $= -2$
A, UP $= -2$
A, DOWN $= -2$

13. $q_{k+1}(B,$ LEFT$)$
$= -1 + V(B)$
$-1 + V(-1)$
$q(B, LEFT) = -2$

14. $q_{k+1}(B, RIGHT)$
$= -1 + V(C) =$
$= -1 + (V(B)$
$q(B, RIGHT) = -1$

15.) $q_{k+1}(B, UP)$
$= -1 + (B)$
$= -1 + (-1)$
$q(B, UP) = -2$

16. $q_{k+1}(B,$ DOWN$)$
$= -1 + (E)$
$-1 + (-1)$ $q(B, DOW) = -2$

NO:
DATE:

17. $\pi_{k+1}(B) = RIGHT$

18.) $q_{k+1}(D, LEFT)$
$= -1 + v(D)$
$= -1 + (-1)$
$q_{k+1}(D, LEFT) = -2$

19. $q_{k+1}(D, RIGHT)$
$= -1 + v(E)$
$= -1 + (-1)$
$q_{k+1}(D, RIGHT) = -2$

20. $q_{k+1}(D, UP)$
$= -1 + v(A)$
$= -1 + (-1)$
$q_{k+1}(D, UP) = -2$

21. $q_{k+1}(D, DOWN)$
$= -1 + v(H)$
$= -1 + 0$
$q_{k+1}(D, DOWN) = -1$

22. $\pi_{k+1}(D) = DOWN$

28. $q_{k+1}(F, LEFT)$
$= -1 + v(E)$
$= -1 + (-1)$
$q_{k+1}(F, LEFT) = -2$

29. $q_{k+1}(F, RIGHT)$
$= -1 + v(F)$
$= -1 + (-1)$
$q_{k+1}(F, RIGHT) = -2$

30. $q_{k+1}(F, UP)$
$= -1 + v(C)$
$= -1 + (0)$
$q_{k+1}(F, UP) = -1$

31) $q_{k+1}(F, DOWN)$
$= -1 + (v(1)$
$-1 + (0)$
$q_{k+1}(F, DOWN) = -1$

32.) $\pi_{k+1}(F) = UP, DOWN$

33.)

34

35.

36

NO: _____

DATE: _____

33.) $q_{k+1}(H, \text{LEFT})$

$= -1 + V(G)$

$-1 + V(O)$

$q_{k+1}(H, \text{LEFT}) = -1$

34 $q_{k+1}(H, \text{RIGHT})$

$= -1 + V(1)$

$= -1 + Y(O)$

$= q_{k+1}(1+, \text{RIGHT}) = -1$

35. $q_{k+1}(H, \text{UP})$

$= -1 + V(E)$

$= -1 + (-1)$

$= q_{k+1}(H, \text{UP}) = -2$

36. $q_{k+1}(H, \text{Down})$

$= -1 + V(H)$

$= -1 + (-1)$

$q_{k+1}(H, \text{Down}) = -2$

37. $\Pi_{k+1}(H) = \text{LEFT}, \text{RIGHT}$

38.

<↑↓>	→	0
↓	<↑↓>	↑↓
0	<→>	0

VALIANT®

NO:

DATE:

39.) $V_*(A) = [-1 + V_{k+1}(A)) + (-1 + V_{k+1}(B)) + (-1 + V_{k+1}(D)) + (-1 + V_{k+1}(A))]^{1/4}$

$V_{k+2}(A) = 1/4\,[\cdots + (-1+-1) + (-1+-1) + (-1+-1) + (-1+-1)$

$V_{k+2}(A) = -2$

40.) $V_{k+2}(B) = 1/4\,[(-1 + V_{k+1}(A)) + (-1 + V_{k+1}(C)) + (-1 + V_{k+1}(E)) + (-1 + V_{k+1}(B))$

$V_{k+2} = 1/4\,[(-1+-1), (-1+0), + (-1+-1), (-1+-1)$

$V_{k+2}(B) = -1.75$

41.) $V_{k+2}(D) = 1/4\,[-1 + V_{k+1}(D)] + (-1 + V_{k+1}(E)) + (-1 + V_{k+1}(G)) + (-1 + V_{k+1}(A))$

$V_{k+2}(D) = 1/4\,(-1,-1) + (-1+-1) + (-1+0) + (-1+-1)$

$V_{k+2}(D) = -1.75$

42.) $V_{k+2}(E) = [(-1 + V_{k+1}(D)) + (-1 + V_{k+1}(F)) + (-1 + V_{k+1}(H)) + -1 + V_{k+1}(B))$

$V_{k+2}(E) = 1/4\,[(-1,-1) + (-1+-1) + (-1+-1) + (-1+-1)$

$V_{k+2}(E) = -2$

VALIANT®

NO:
DATE:

43.) $v_{k+2}(F) = 1/4 \left[(-1 + v_{k+1}(E)) + (-1 + v_{k+1}(F)) + (-1 + v_{k+1}(1)) + (-1 + v_{k+1}(0))\right]$

$v_{k+2}(F) = 1/4 \left[(-1 + -1) + (-1 + -1) + (-1 + 0), (-1 + 0)\right]$

$v_{k+2}(F) = -1.5$

44.) $v_{k+2}(H) = 1/4 \left[(-1 + v_{k+1}(G)) + (-1 + v_{k+1}(1)) + (-1 + v_{k+1}(E)) + (-1 + v_{k+1}(H))\right]$

$v_{k+2}(H) = 1/4 \left[(-1 + 0), (-1 + 0), (-1 + 1), (-1 + -1)\right]$

$v_{k+2}(H) = -1.5$

45.) $q_{k+2}(A, \text{LEFT}) = -1 + v(A)$

$= -1 + (-2)$

$q_{k+2}(A, \text{LEFT}) = -3$

$q_{k+2}(A, \text{RIGHT}) = -1 + v(B)$

$= -1 + (-1.75)$

$q_{k+2}(A, \text{RIGHT}) = -2.75$

NO:
DATE:

$q_{k+2}(A, UP)$
$= -1 + V(A)$
$= -1 + (-2)$
$q_{k+2}(A, UP) = -3$

$q_{k+2}(A, DOWN)$
$= -1 + V(D)$
$= -1 + (-1.75)$
$q_{k+2}(A, DOWN) = -2.75$

46.) $q_{k+2}(B, LEFT)$
$= -1 + V(A)$
$= -1 + (-2)$
$= q_{k+2}(B, LEFT) = -3$

$q_{k+2}(B, RIGHT)$
$= -1 + V(C)$
$= -1 + (-1.75)$
$q_{k+2}(B, RIGHT) = -1$

$q_{k+2}(B, UP)$
$= 1 + V(B)$
$= -1 + (-1.75)$
$q_{k+2}(B, UP) = -2.75$

$q_{k+2}(B, DOWN)$
$= -1 + V(E)$
$= -1 + (-2)$
$q_{k+2}(B, DOWN) = -3.$

47.) $q_{k+2}(D, LEFT)$
$= -1 + V(D)$
$= -1 + (-1.75)$
$q_{k+2}(B, LEFT) = -2.75$

$q_{k+2}(D, RIGHT)$
$= -1 + V(E)$
$= -1 + (-2)$
$q_{k+2}(D, RIGHT) = -3$

VALIANT

NO:
DATE:

$q_{k+2}(D, UP)$
$= -1 + V(A)$
$= -1 + (-2)$
$q_{k+2}(D, UP) = -3$

$q_{k+2}(D, DOWN)$
$= -1 + V(G)$
$= -1 + (-1.75)$
$q_{k+2}(D, DOWN) = -2.75 - 1$

48. $q_{k+2}(E, LEFT)$
$= -1 + V(D)$
$= -1 + (-1.75)$
$q_{k+2}(E, LEFT) = -2.75$

$q_{k+2}(E, RIGHT)$
$= -1 + V(F)$
$= -1 + (-1.5)$
$q_{k+2}(E, RIGHT) = -2.05$

$q_{k+2}(E, UP)$
$= -1 + V(B)$
$= -1 + (-1.75)$
$= 2.75$

$q_{k+2}(E, DOWN)$
$= -1 + V(H)$
$= -1 + (-1.5)$
$q_{k+2}(E, DOWN) = -2.05$

49. $q_{k+2}(F, LEFT)$
$= -1 + V(E)$
$= -1 + (-2)$
$q_{k+2}(F, LEFT) = -2.75 - 3$

$q_{k+2}(F, RIGHT)$
$= -1 + V(F)$
$= -1 + (-1.5)$
$= q_{k+2}(F, RIGHT) = -2.05$

$q_{k+2}(F, UP)$
$= -1 + V(C)$
$= -1 + (-1.75)$
$q_{k+2}(F, UP) = -2.75 - 1$

$q_{k+2}(F, DOWN)$
$= -1 + V(I)$
$= -1 + (-1.75) \cdot (-1)$
$q_{k+2}(F, DOWN) = 2.75$

NO:
DATE:

50. $q_{k+2} = (H, LEFT)$
$= -1 + \gamma\, (G) = -1 + (-1)$
$q_{k+2}(H, LEFT) = -1$

$q_{k+2} = (H, RIGHT)$
$= \gamma\, -1 + V(1)$
$= -1 + (-1)$
$q_{k+2}(H, RIGHT) = -1$

46
$q_{k+2}(H, UP)$
$= -1 + V(E)$
$= -1 + (-1.75)$
$= -2.75$

$q_{k+2}(H, DOWN)$
$= -1 + V(H)$
$= -1 + (1.5)$
$= -2.05$

c
51.) $\pi^*(A) =$ RIGHT, DOWN
52.) $\pi^*(B) =$ RIGHT
53.) $\pi^*(D) =$ DOWN
54.) $\pi^*(E) =$ RIGHT, DOWN
55.) $\pi^*(F) =$ UP, DOWN
47 56.) $\pi^*(H) =$ LEFT, RIGHT

57.)

-2	-1.75	0
-1.75	-2	-1.5
0	-1.5	0

58.

↓→	→	G
↓	↓→	↑↓
0	←→	0