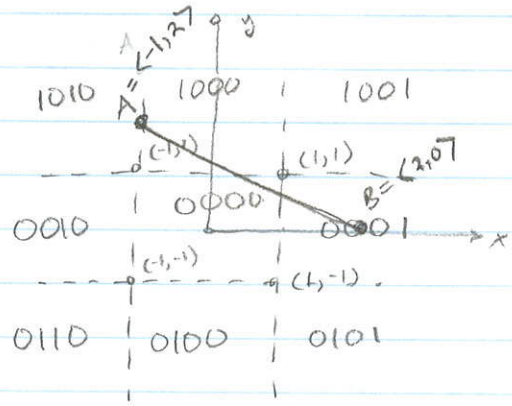
CPSC 314 - Term 2 2010

H4

1.



OC(A) = 1000

OC(B) = 0001

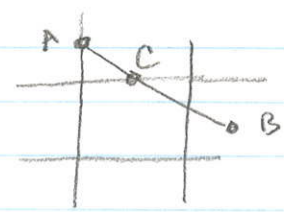
if OC(P_1) && OC(P_2) == 0 accept

OC(P_1) & OC(P_2) != 0 reject

a) Top edge (y = 1) (New point C)

OC(A) = 1000 } cannot trivially accept or reject

OC(B) = 0001



line: $\langle -1, 2\rangle + t\langle 3, -2\rangle$

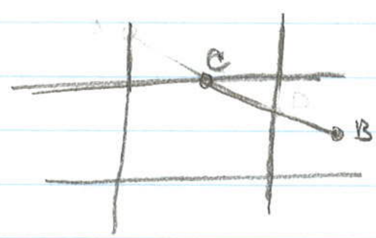
$C = \langle x, 1\rangle$

$\rightarrow$ $3t - 1 = x$ $\rightarrow$ $t = \frac{1}{2}$, $x = \frac{1}{2}$

$-2t + 2 = 1$

$\boxed{C = \langle \frac{1}{2}, 1\rangle}$ $\boxed{OC(C) = 0000}$

Discard AC, keep CB



b) Bottom edge (y = -1)

OC(C) = 0000 } cannot trivially accept or reject

OC(B) = 0001

line: $\langle \frac{1}{2}, 1\rangle + t\langle \frac{3}{2}, -1\rangle$

$D = \langle x, -1\rangle$

$\rightarrow$ $\frac{3t+1}{2} = x$ $\rightarrow$

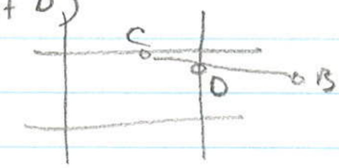
$-t + 1 = -1$ $t = 2$, $x = \frac{7}{2}$

$t > 1 \rightarrow$ No intersection

Keep CB

CPSC 314 - Term 2 2010

c) Right Edge $(x=1)$ (New Point D)



line: $\langle \frac{1}{2}, 1 \rangle + t \langle \frac{3}{2}, -1 \rangle$

$D = \langle 1, y \rangle$

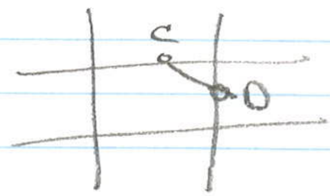
$\rightarrow \frac{3t+1}{2} = 1 \rightarrow t = \frac{1}{3}$

$-t+1 = y \qquad y = \frac{2}{3}$

$\boxed{D = \langle 1, \frac{2}{3} \rangle}$

Keep CD, Discard DB

d) Left Edge $(x=-1)$



$\left.\begin{array}{l} OP(C) = 0000 \\ OP(D) = 0000 \end{array}\right\}$ accept!

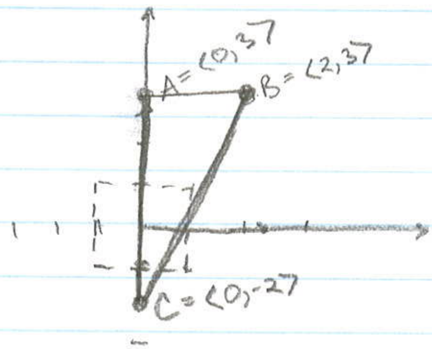
No need to perform intersection test.

$\boxed{\text{Final clipped line: } CD, \text{ where } C = \langle \frac{1}{2}, 1 \rangle \text{ and } D = \langle 1, \frac{2}{3} \rangle}$

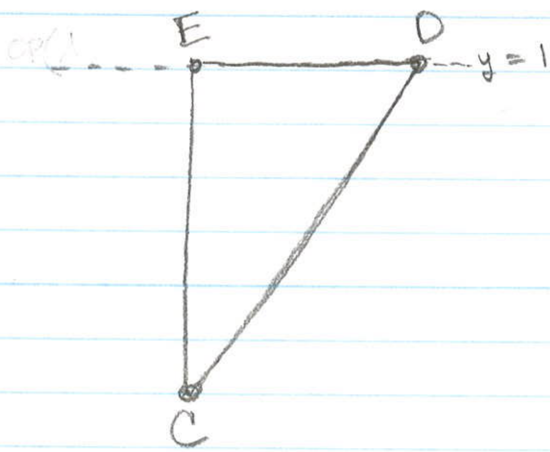
CPSC 314 - Term 2 2010

H4

2.

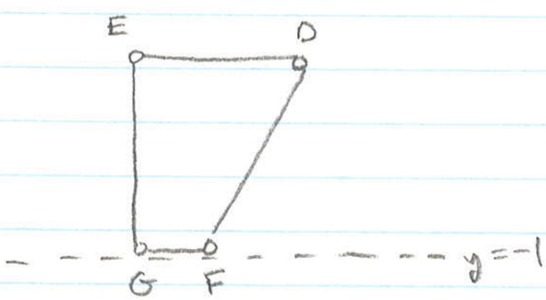


a) Top edge $(y=1)$



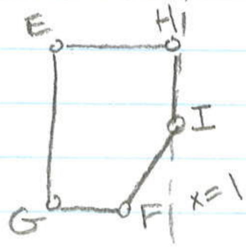
ABC → EDC

b) Bottom edge $(y=-1)$



EDC → EDFG

c) Right edge $(x=1)$



EDFG → EHIFG

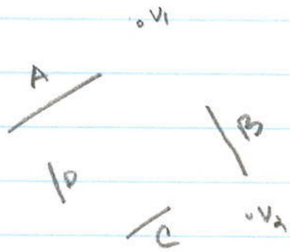
d) Left edge $(x=-1)$

No clipping takes place.

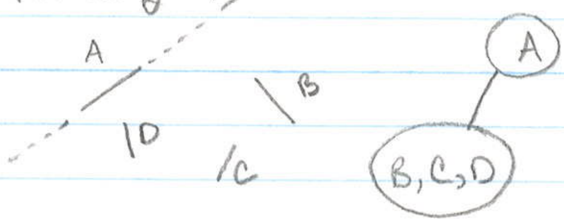
CPSC 314 - Term 2 2010

H4

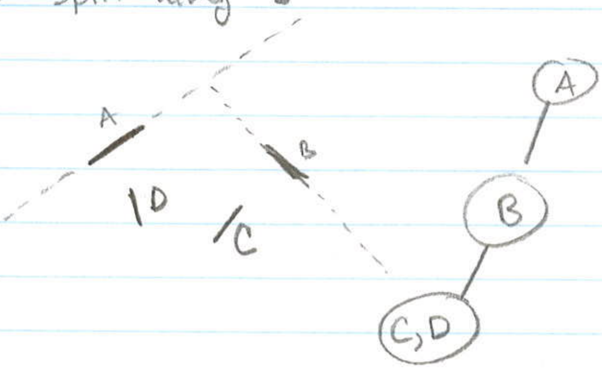
3.



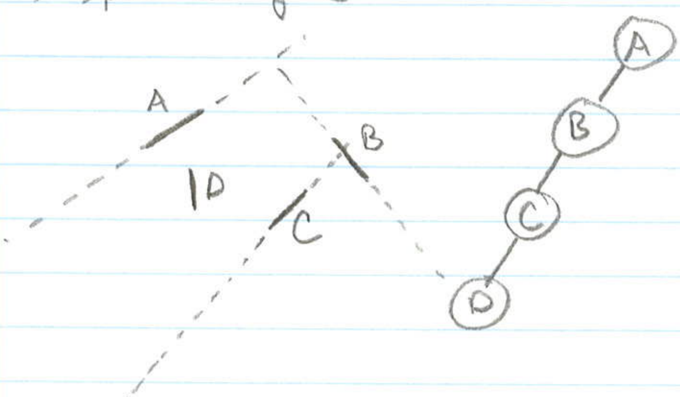
a) split along A



b) Split along B



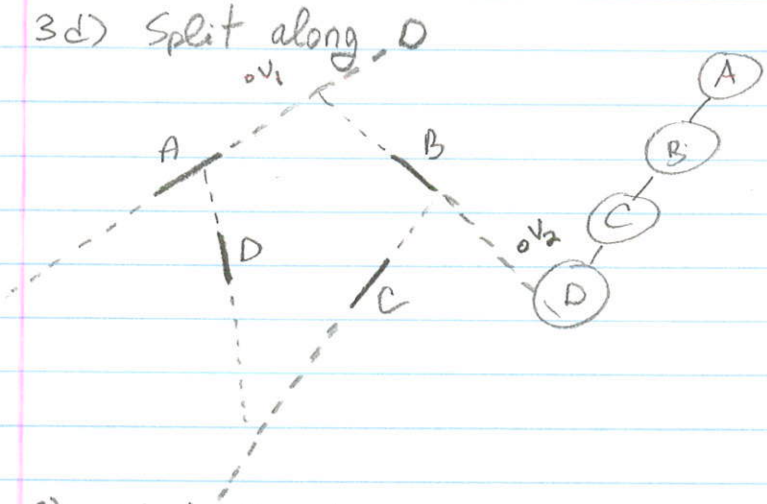
c) Split along C



CPSC 314 - Term 2 2010

H4

3d) Split along D



e) Start @ A

v_1 is on right-side of A,

→ traverse left-hand side

Traverse B

v_1 is on left-hand side of B,

→ ~~traverse right-hand side~~

→ ~~empty, recurse back~~

→ draw B

→ traverse left-hand side of B

Traverse C

v_1 is on left-hand side of C

→ traverse rhs

→ empty, recurse back

→ draw C

→ traverse lhs of C

Traverse D

v_1 is on rhs of D

→ traverse lhs

→ empty, recurse back

→ draw D

→ traverse rhs of D → end traversal

Traverse A

draw A

traverse rhs of A

→ empty

End traversal.

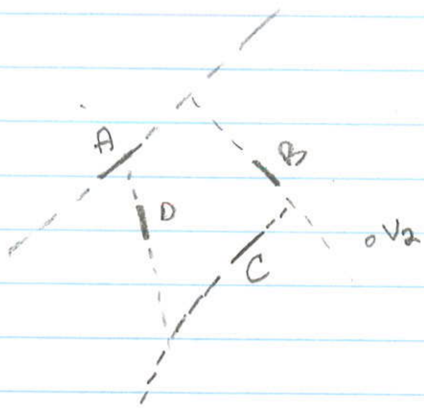
Final draw call (from left to right)

$\boxed{\text{B C D A}}$

CPSC 314 - Term 2 2010

H4

3.5)



Start @ A

v_2 is on lhs → traverse rhs

→ empty, recurse back

draw A

traverse lhs

Traverse B

v_2 is on rhs → traverse lhs

Traverse C

v_2 is on rhs → traverse lhs

Traverce D

v_2 is on rhs → travers lhs

→ empty! Recurse back

Draw D

Traverse rhs → empty! Pop back to C

Draw C

Traverce rhs - empty! Pop back to B

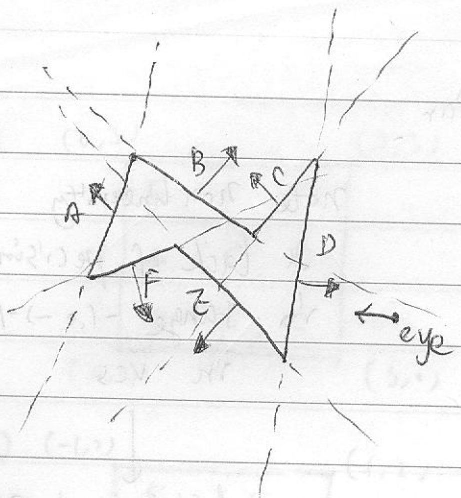
Draw B

Traverse rhs → empty! Pop back to A

End traversal.

Final draw Command.
ADCB

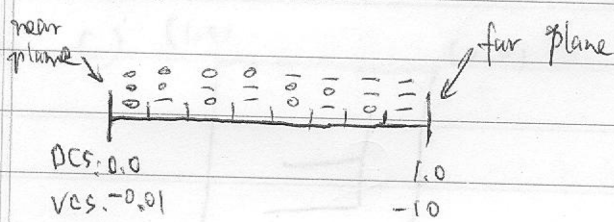
Q4



cull A, C, E

Q5

3 bits $\rightarrow 2^3 = 8$ bins



$$Z_{NDCS} = \frac{f+n}{f-n} + \frac{1}{Z_{VCS}}\left(\frac{2\cdot f\cdot n}{f-n}\right)$$

$$Z_{DCS} = \frac{1}{2} + \frac{1}{2} Z_{NDCS}$$

$$Z_{DCS} = \frac{1}{2} + \frac{1}{2}\left(\frac{f+n}{f-n} + \frac{1}{Z_{VCS}}\left(\frac{2\cdot f\cdot n}{f-n}\right)\right)$$

$$Z_{VCS}\, Z_{DCS} = Z_{VCS}\left(\frac{1}{2} + \frac{1}{2}\frac{f+n}{f-n}\right) + \frac{1}{2}\frac{2fn}{f-n}$$

$$Z_{VCS} = \frac{-fn}{f-n} \Big/ \left(Z_{DCS} - \frac{1}{2} - \frac{1}{2}\frac{f+n}{f-n}\right)$$

$$Z_{VCS} = \frac{-fn}{(f-n)Z_{DCS} - \frac{1}{2}(f-n) - \frac{1}{2}(f+n)}$$

$$Z_{VCS} = \frac{-fn}{(f-n)Z_{DCS} - f}$$

$$Z_{VCS} = \frac{-fn}{(f-n)Z_{DCS} - f}$$

$$f = -10 \quad n = -0.01$$

$$\therefore Z_{VCS} = \frac{-0.1}{(-9.99)V_{DCS} + 10}$$

bin #	Z-buffer value	Z DCS	Z VCS	
		1.000	-10	← far
7	111			
		0.875	-0.0714	
6	110			
		0.750	-0.0399	
5	101			
		0.625	-0.0266	
4	100			
		0.500	-0.0200	
3	011			
		0.375	-0.0160	
2	010			
		0.250	-0.0133	
1	001			
		0.125	-0.0114	
0	000			
		0	-0.01	← near

8 bins

9 planes

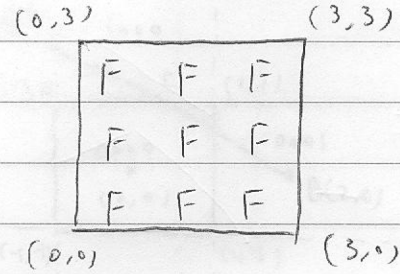
note non linearity & lack of precision in range $-1.0 \rightarrow -10.0$ in VCS

↓

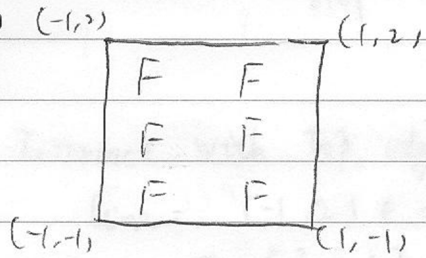
definitely want more than 3 bits in z buffer.

Q6

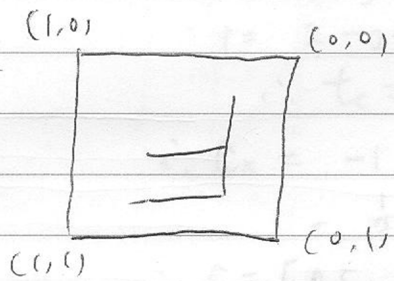
a)



b)



c)



d)