מרצה : ד"ר אלה שפר

מתרגל : דני ברונשטיין

מבחן סופי

מועד א'

שם : _____

מס' סטודנט : _____

הנחיות :

1. בבחינה שלפניכם 4 דפים כולל דף זה. בדקו זאת.
2. עליכם לענות על 6 מתוך 7 השאלות. כל השאלות בעלי משקל שווה.
3. כתבו בקצרה. כל המאריך גורע!
4. משך הבחינה : שעתיים.
5. יש לכתוב את כל התשובות במחברת המצורפת.
6. יש להגיש את טופס הבחינה והמחברת המצורפת.
7. חומר עזר **מותר** : כל חומר כתוב ו/או מודפס אחר (ספר, חוברת, מחברת, שקפים, הדפסות וכו'...)
8. חומר עזר **אסור** : כל פריט אלקטרוני.

בהצלחה

שאלה	נקודות
1	
2	
3	
4	
5	
6	
7	
סיכום	

1) Curve Continuity.
Given the following parametric curves:

$f_1(u) = (u, u)$ $\quad\quad\quad\quad\quad\quad$ $u \in [0, 0.5]$
$f_2(u) = (1-u, 1-u)$ $\quad\quad\quad\quad$ $u \in [0.5, 1]$
$f_3(u) = (2u^2-u+0.5, 2u^2-u+0.5)$ $\,$ $u \in [0.5, 1]$
$f_4(u) = (2u^2, 2u^2)$ $\quad\quad\quad\quad\quad$ $u \in [0.5, 1]$

fill the following table with $(\times, \sqrt{})$ for joining curves.

|	C^0	C^1	G^1
f_1 and f_2			
f_1 and f_3			
f_1 and f_4			
f_2 and f_3			

2) Clipping
a. Given the following polygonal Domain, will the Cohen Sutherland algorithm clip arbitrary edges correctly, with respect to the Domain? Explain shortly why.
b. Will Cyrus Beck clipping work for the same polygonal Domain? Explain shortly why.
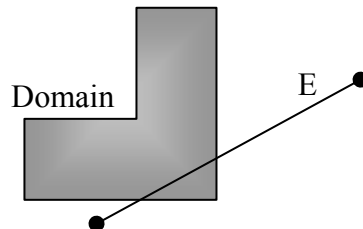
c. Describe an algorithm to clip an edge p_0, p_1 with a circular domain at center (o_x, o_y) with radius R.
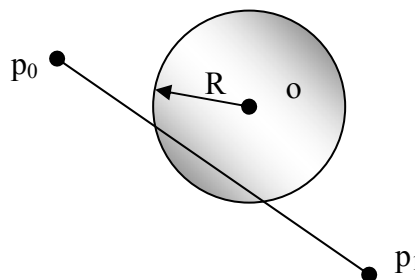
3) BSP Trees

a. We want to build a **2D** autopartition BSP Tree. Is it possible **for all existing** layouts of n disjoint edges to build a BSP tree of exactly n nodes (i.e. no partitions?) If so, explain. If not, show a counter example.

b. Is it important to have a balanced tree for Hidden Surface Removal? Explain why.
c. Is it important to have a balanced tree for Polyherdra Representation? Explain why.
d. Is it important to have Orthogonal Partitions for Ray Tracing implementation? Explain why.

4) A quadratic Bezier curve $\alpha(t)$ is defined by p_0, p_1 and p_2. Find the cubic Bezier curve $\beta(t)$ defined by q_0, q_1, q_2 and q_3 such that the curve is identical: $\alpha(t) \equiv \beta(t)$.
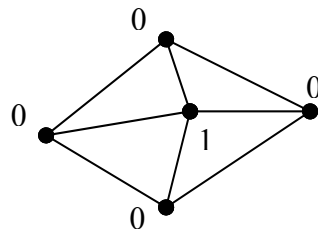Hint, Use de Casteljeu and rely on symmetry.

5) Antialiasing.
Given the grayscale output of a Gaussian filtering, on an original black and white image, is it possible to reconstruct the original image? If yes, explain how. If no, explain why.
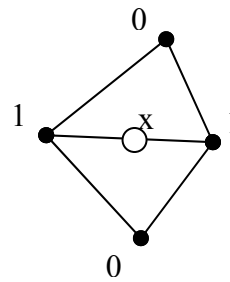
$$\text{Gaussian Filter: } \frac{1}{17}\begin{pmatrix} 1 & 2 & 1 \\ 2 & 7 & 2 \\ 1 & 2 & 1 \end{pmatrix}$$

6) Subdivision.
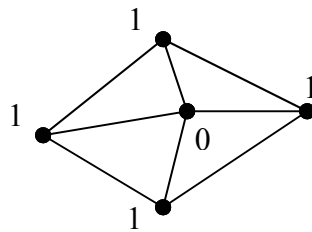a. Given a subdivision mask,

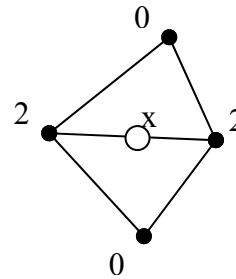for node-vertices   for edges

does the scheme converge? To which surface does this converge?

b. Given a subdivision mask,

for node-vertices   for edges

does the scheme converge? To which surface does this converge?

7) Collection.
a. If we rotate an image by 45^0 eight times, do we get the same image? Explain.
b. Given a **real life** scene with only transparent and diffuse objects, will there be a difference in α-buffer rendering and Ray Tracing rendering?
c. Given two high resolution images, one of a highly detailed model, and another of a low detailed model with corresponding bump mapping, is there a way to tell the models apart?

Good Luck!