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**Part A: Answers**

1. Proof of “A ⊕ B = B ⊕ A”

Dilation (sometimes called “Minkowsky addition”) is defined as follows.

A ⊕ B = {c | c = a + b for some a ∈ A and b ∈ B}

For B ⊕ A is

B ⊕ A = {c | c = b + a for some a ∈ A and b ∈ B}

From the both equations we know that a = b is always equal to b + a.

So, “A ⊕ B = B ⊕ A”

Reference: http://homepages.inf.ed.ac.uk/rbf/CVonline/LOCAL\_COPIES/MORSE/morph1.pdf



opening operation (A ° B)

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closing operation (C • B)

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2. [ [ b − (~c) ] + (~d) ] − [ [a – (~a) ] + d ] PDL is

b ~d ~c

d

a ~a



for figure 1:

[[ e \* f ] + [ [ a – ( ~a ) ] + d ]

for figure 2:

[ e \* f ] + [ e \* f]