Quiz 7: CS4640 Name ____________________

1. Recall the definitions of erosion and dilation:

$$A \oplus B = \{z | (\hat{B})_z \bigcap A \neq \varnothing\}$$

$$A \ominus B = \{z | (B)_z \subseteq A\}$$

Use the definitions of erosion and dilution to prove the following:

$$(A \oplus B)^c = A^c \ominus \hat{B}$$

$$(A \oplus B)^c = \{z | (\hat{B})_z \bigcap A \neq \varnothing\}^c$$

$$= \{z | (\hat{B})_z \bigcap A = \varnothing\}$$

$$= \{z | (\hat{B})_z \subseteq A^c\}$$

$$= A^c \ominus \hat{B}$$

3. What is the limiting effect of repeatedly dilating a set of foreground pixels in an image? Assume that a trivial (one point) structuring element is not used.

The dilated image grows without bound.

4. In class we looked at one definition of Dilation. Like spatial convolution it involves flipping the SE about its origin and then successively displacing it so that it slides over a foreground image. Discuss the ways in which Dilation and spatial convolution differ.

- Dilation is based on set operations, spatial convolution is a sum of products
- Dilation is a non linear operation, spatial convolution is a linear operation.
- If Dilation is performed on a binary image, the result is binary. Spatial convolution will produce a gray-level result.