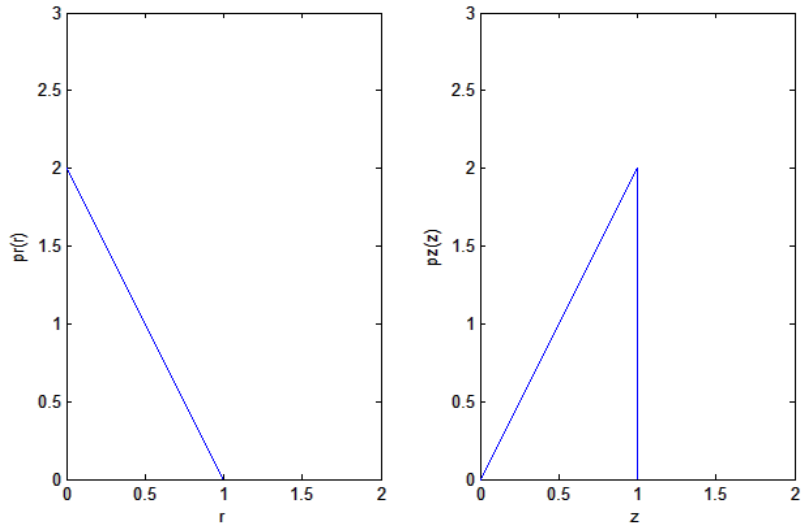
(Assigned on 2/8, due on 2/15)

3.6 Explain why the discrete histogram equalization technique does not, in general, yield a flat histogram.

3.9 Assuming continuous values, show by example that it is possible to have a case in which the transformation function given in Eq. (3.3-4) satisfies conditions (a) and (b) in Section 3.3.1 but its inverse may fail condition (a').

3.11 An image with intensities in the range [0,1] has the PDF $p_r(r)$ shown in the following diagram. It is desired to transform the intensity levels of this image so that they will have the specified $p_z(z)$ shown. Assume continuous quantities and find the transformation (in terms of r and z) that will accomplish this.



3.15 The implementation of linear spatial filters requires moving the center of a mask throughout an image and, at each location, computing the sum of products of the mask coefficients with the corresponding pixels at that location (see Section 3.4). A lowpass filter can be implemented by setting all coefficients to 1, allowing use of a so-called box-filter or moving-average algorithm, which consists of updating only the part of the computation that changes from location to the next.

(a) Formulate such an algorithm for an n×n filter, showing the nature of the computations involved and the scanning sequence used for moving the mask around the image.

(b) The ratio of the number of computations performed by a brute-force implementation to the number of computations performed by the box-filter algorithm is called *computation advantage*. Obtain the computational advantage in this case and plot it as a function of n for n>1. The $1/n^2$ scaling factor is common to both approaches, so you need not consider it in obtaining the computation advantage. Assume that the image has an outer border of zeros that is wide enough to allow you ignore border effects in your analysis.

3.25 You saw in Fig. 3.38 that the Laplacian with a -8 in the center yields sharper results than the one with a -4 in the center. Explain the reason in detail.