Q 1.

1. False, The eye is subject to illusions, quantitatively imprecise, limited to a narrow range of frequencies of radiation and passive.

2.False, Computer vision and image processing are two different fields.

3. False, Image enhancement is also needed by machine perception.

4. False, PMF is for the discrete domain and PDF is for the continuous domain.

5. False, The image processing has image as input and image as output.

6. False, Image rotation changes the location of pixels not their intensities.

7. False, Setting the most significant bit of the image pixels to zero darkens the image and removes the main features of the objects in the scene.

8. False, The probability of the appearance of the white color in a given image equals the number of white pixels in the image divided by the total number of pixels.

9. False, Images with a good contrast always have a histogram that covers broad range of the gray scale and the distribution of pixels is not too far from uniform

10. True, Histogram equalization enlightens dark images and darkens bright images.

Q 2.

For a PMF

$$\sum_r p_r(r) = 1 \qquad (1)$$

r	$p_r(r)$
1	$Ae^{-(1-2)^2} = 0.3679\ A$
2	A
3	$0.3679\ A$
4	$0.0183\ A$
5	$0.0001\ A$
$\sum_r p_r(r)$	$1.7542\ A$

In (1)

$$1.7542A = 1 \quad \rightarrow \quad A = 0.5701$$

Q 3.

For a PDF

$$\int_0^{255} p_r(r) = 1$$

$$\int_0^{255} Ae^{-\frac{r}{255}} = 1$$

$$-255A\left(e^{-\frac{r}{255}}\right)_0^{255} = 1$$

$$-255A(e^{-1} - 1) = 1 \quad \rightarrow \quad A = 0.0062$$

For histogram equalization in the continuous domain

$$P_z(z) = P_r(r) \qquad (1)$$

To determine $P_r(r)$

$$P_r(r) = \int_0^r p_r(r)dr$$

$$= \int_0^r 0.0062e^{-\frac{r}{255}}$$

$$= 0.0062 \times -255\left(e^{-\frac{r}{255}}\right)_0^r$$

$$P_r(r) = -1.582(e^{-\frac{r}{255}} - 1)$$

To determine $P_z(z)$

$$p_z(z) = \frac{1}{255 - 0}$$

$$P_z(z) = \int_0^z p_z(z)dz$$

$$P_z(z) = \frac{z}{255}$$

In (1)

$$\frac{z}{255} = -1.582\left(e^{-\frac{r}{255}} - 1\right)$$

$$z = 403.41\left(e^{-\frac{r}{255}} - 1\right)$$