Homework No. 4

1.

A Gaussian random variable X has the pdf

$$f_X(x) = \frac{1}{\sqrt{2\pi}\,\sigma}\, e^{-(x-\mu)^2/2\sigma^2}, \qquad -\infty < x < \infty.$$

Find the pdf of the random variable $Y = aX + b$.

2.

Let $Y = \sum_{i=1}^{P} X_i$, where the X_i are independent, identically distributed Gaussian random variables with mean 1 and variance 2. Write the pdf of Y.

3.

Let X and Y be independent, Gaussian random variables with means μ_x and μ_y and variances σ_x^2 and σ_y^2, respectively. Define the random process $Z(t) = X \cos \omega_c t + Y \sin \omega_c t$, where ω_c is a constant.
(a) Under what conditions is $Z(t)$ WSS?
(b) Find $f_Z(z; t)$
(c) Is the Gaussian assumption required for part (a)?

4. Find an expression for the average probability of error for the 16 QAM signal constellation discussed in class.