QF620 Stochastic Modelling in Finance
Assignment 3/4
Due Date: 25-Oct-2023

1. Find the mean and variance of X_t if

   (a)

   $$dX_t = \mu dt + \sigma dW_t.$$

   (b)

   $$dX_t = \mu X_t dt + \sigma X_t dW_t.$$

   (c)

   $$dX_t = \kappa(\theta - X_t)dt + \sigma dW_t.$$

2. Consider the two stochastic differential equations below:

   $$dX_t = rX_t dt + \sigma X_t dW_t$$
   $$dY_t = rY_t dt + \sigma Y_t d\tilde{W}_t$$

   Use Itô's formula to derive the stochastic differential equation for $Z_t = \frac{X_t}{Y_t}$, is

   (a) W_t and $\tilde{W}_t$ are independent.
   (b) W_t and $\tilde{W}_t$ have a correlation of 1.
   (c) W_t and $\tilde{W}_t$ have a correlation of ρ.