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MA323 - Lab Submission

In [4]:

```
import numpy as np
import matplotlib.pyplot as plt
```

Question 1:

$$W(t_{i+1}) = W(t_i) + \sqrt{t_{i+1} - t_i} \cdot Z_{i+1}$$

In [1]:

```
T=5
```

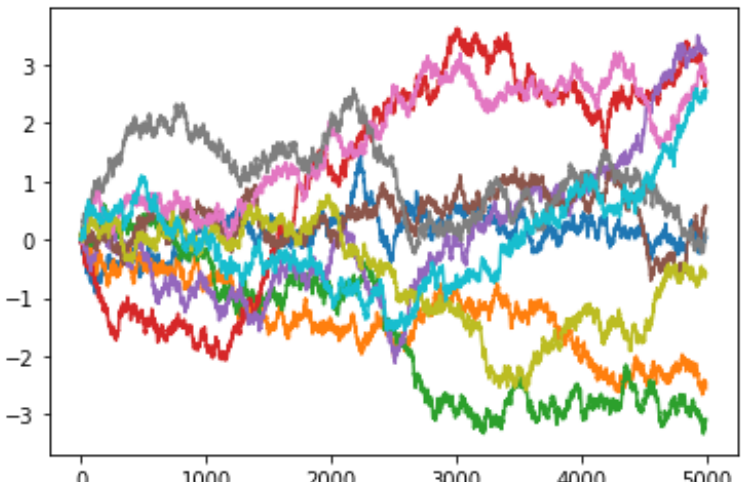
In [2]:

```
def b(step):
    dt = T/step
    w = np.ones(step)
    w[0]=0
    for i in range(1,step):
        # Sampling from the Normal distribution
        yi = np.random.normal()
        w[i]=w[i-1]+np.sqrt(dt)*yi

    return w
```

In [5]:

```
for i in range(10):
    plt.plot(b(5000))
plt.show()
```



Question 2:

$$X(t_{i+1}) = X(t_i) + \mu(t_{i+1} - t_i) + \sigma\sqrt{t_{i+1} - t_i} \cdot Z_{i+1}.$$

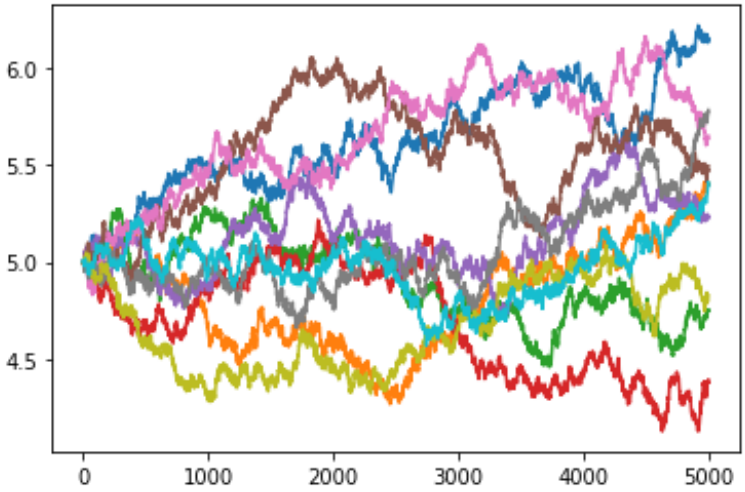
In [6]:

```
def bx(step):
    dt = T/step
    x = np.ones(step)
    x[0]=5
    mu=0.06
    sig=0.3
    for i in range(1,step):
        # Sampling from the Normal distribution
        yi = np.random.normal()
        x[i]=x[i-1]+mu*dt+sig*np.sqrt(dt)*yi

    return x
```

In [7]:

```
for i in range(10):
    plt.plot(bx(5000))
plt.show()
```



Question 3:

$$Y(t_{i+1}) = Y(t_i) + \mu(t_i)(t_{i+1} - t_i) + \sigma(t_i)\sqrt{t_{i+1} - t_i} \cdot Z_{i+1}.$$

In [10]:

```
def y_mu(t):
     return 0.0325-(0.05*t)
```

In [11]:

```
def y_sig(t):
     return 0.012+0.0138*t+0.00125*t*t
```

In [12]:

```
def by(step):
    dt = T/step
    y = np.ones(step)
    y[0]=5


    for i in range(1,step):
        # Sampling from the Normal distribution
        yi = np.random.normal()
        y[i]=y[i-1]+y_mu(dt*i)*dt+y_sig(dt*i)*np.sqrt(dt)*yi

    return y
```

In [13]:

```
for i in range(10):
    plt.plot(by(5000))
plt.show()
```