

## EE475 HW#3

### MATLAB Script

```
%EE475 HW3 Problem 7
for f = 9:0.1:9.5
    x = sqrt(2*f);
    BER = 1/(x*sqrt(2*pi))*exp(-(x.^2)/2)
end
f = 9.1;
x = sqrt(2*f);
BER = 1/(x*sqrt(2*pi))*exp(-(x.^2)/2);
fprintf('The value of f is equal to %.1f since the BER value is %0.5f\n',f, BER);
```

### MATLAB Command Window

```
>> EE475_HW3_Problem7
```

```
BER =
```

```
1.1604e-05
```

```
BER =
```

```
1.0442e-05
```

```
BER =
```

```
9.3971e-06
```

```
BER =
```

```
8.4570e-06
```

```
BER =
```

```
7.6114e-06
```

```
BER =
```

```
6.8507e-06
```

```
The value of f is equal to 9.1 since the BER value is 0.00001
```

```
%EE475 HW3 Problem 8 Part A
```

```
for f = 3:0.1:100
```

```
    %BPSK
```

```
    x = sqrt(2*f);
```

```
    BER = 1/(x*sqrt(2*pi))*exp(-(x.^2)/2);
```

```
    %creating the plot
```

```
    horizontal = pow2db(f);
```

```
    semilogy(horizontal, BER, 'b--*');
```

```
    hold on;
```

```
    %DPSK
```

```
    BER = 0.5*exp(-f);
```

```
    %creating the plot
```

```
    horizontal = pow2db(f);
```

```
    semilogy(horizontal, BER, 'r-*');
```

```
    %16QAM
```

```
    l = 4;
```

```
    x = sqrt(((3*log2(l))/((l^2)-1))*(2*f));
```

```
    q = 1/(x*sqrt(2*pi))*exp(-(x.^2)/2);
```

```
    BER = 2*(1-(l^-1))/log2(l)*q;
```

```
    %creating the plot
```

```
    horizontal = pow2db(f);
```

```
    semilogy(horizontal, BER, 'y-*');
```

```
    %32QAM
```

```
    l = sqrt(32);
```

```
    x = sqrt(((3*log2(l))/((l^2)-1))*(2*f));
```

```
    q = 1/(x*sqrt(2*pi))*exp(-(x.^2)/2);
```

```
    BER = 2*(1-(l^-1))/log2(l)*q;
```

```
    %creating the plot
```

```
    horizontal = pow2db(f);
```

```
    semilogy(horizontal, BER, 'c-*');
```

```
end
```

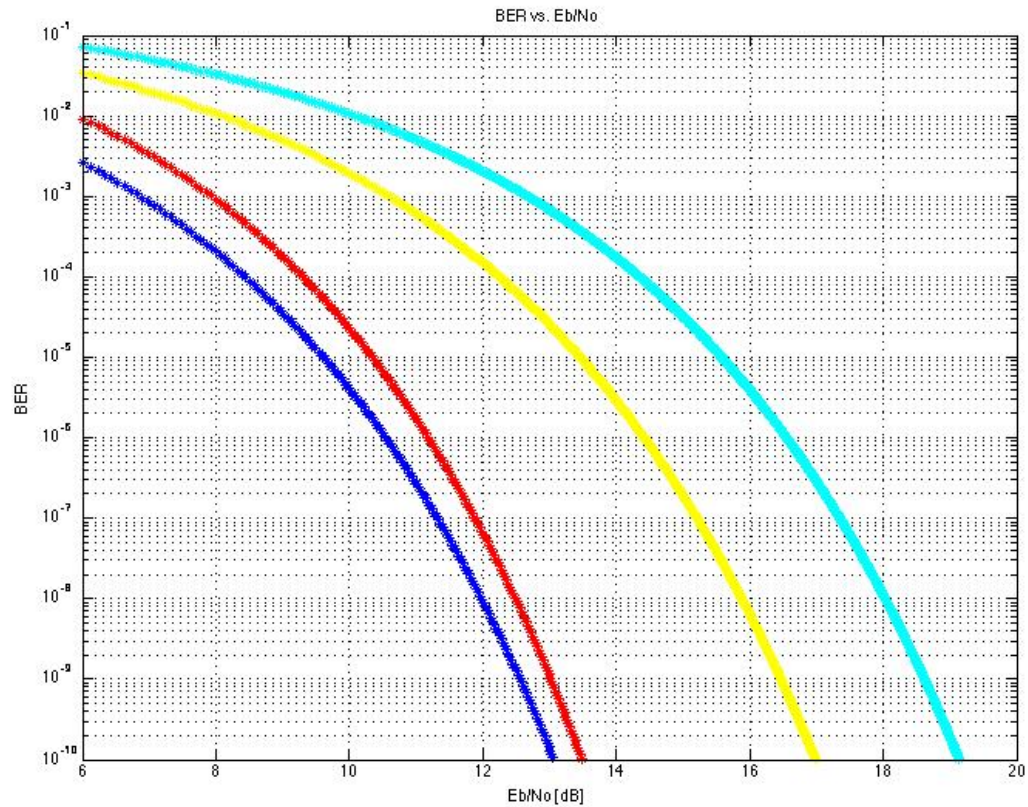
```
grid on
```

```
xlabel('Eb/No [dB]');
```

```
ylabel('BER');
```

```
title('BER vs. Eb/No');
```

```
axis([6, 20, 1e-10, 1e-1]);
```



%EE475 HW3 Problem 8 Part B

f = 10;

%BPSK

x = sqrt(2\*f);

BER1 = 1/(x\*sqrt(2\*pi))\*exp(-(x.^2)/2)

%DPSK

BER2 = 0.5\*exp(-f)

%16QAM

l = 4;

x = sqrt(((3\*log2(l))/((l^2)-1))\*(2\*f));

q = 1/(x\*sqrt(2\*pi))\*exp(-(x.^2)/2);

BER3 = 2\*(1-(l^-1))/log2(l)\*q

%32QAM

l = sqrt(32);

x = sqrt(((3\*log2(l))/((l^2)-1))\*(2\*f));

q = 1/(x\*sqrt(2\*pi))\*exp(-(x.^2)/2);

$$\text{BER4} = 2 \cdot (1 - (l^{-1})) / \log_2(l) \cdot q$$

$$\text{BER1} =$$

$$4.0500\text{e-}06$$

$$\text{BER2} =$$

$$2.2700\text{e-}05$$

$$\text{BER3} =$$

$$0.0019$$

$$\text{BER4} =$$

$$0.0106$$