1. Determine Fade Margin for a 5% outage probability for Rician fading for
   
   a) $k = 12\,\text{dB}$
   b) $k = 6\,\text{dB}$
   c) Rayleigh

From Chart

a) $FM = -3.1\,\text{dB} \Rightarrow 3.1\,\text{dB} \text{ Fade Margin}$

Matlab: $P[r \leq R] = 1 - Q_m(\sqrt{2k}, \sqrt{2k} R_{\text{min}})$

$k = 15.85$, $R_{\text{min}} = 10^\frac{-3.1}{60} = 0.6998$

$P[r \leq R] = 3.6\% \Rightarrow R_{\text{min}} = -2.8\,\text{dB for 5\%}$

b) From Chart $FM = -6.5\,\text{dB}$

Matlab: $k = 3.981$

$R = 0.4732$

$P[r \leq R] = 4.0\%$

$c) \text{ From Chart: } FM = -11.5\,\text{dB}$

$P[r \leq R] = 1 - e^{\frac{-R^2}{2R_0^2}}$

$0.05 = 1 - e^{\frac{-R^2}{2(0.7856)^2}}$

$-0.95 = -0.7856 R$

$a_1(1.20986) = R$

$0.1900 = R$

$\Rightarrow R = -14.4\,\text{dB}$

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<thead>
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<th></th>
<th>Chart</th>
<th>Matlab</th>
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<tbody>
<tr>
<td>a)</td>
<td>3.1 dB</td>
<td>2.8 dB</td>
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<tr>
<td>b)</td>
<td>6.5 dB</td>
<td>5.9 dB</td>
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<tr>
<td>c)</td>
<td>11.5 dB</td>
<td>14.4 dB</td>
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</table>
2. Median RSS is -70 dBm. What is probability that
   RSS > -80 dBm for
   a) K = 9 dB
   b) K = 3 dB

Signal level R (dB about median) = -80 dBm - (-70 dBm) = -10 dB

a) From chart \( P[r > -10 dB] = 0.2\% \)
   \[ \Rightarrow P[r > -80 dBm] = 1 - 0.2\% = 99.8\% \]

b) From chart \( P[r \leq -10 dB] = 3.9\% \)
   \[ \Rightarrow P[r > -80 dBm] = 1 - 3.9\% = 96.1\% \]

\[ a) 99.8\% \]
\[ b) 96.1\% \]