```
Exit[];

na = 4;
s[i_, j_] = Piecewise[{{0, i < j}}, σ[i, j]];
r[i_, j_] = Piecewise[{{1, i == j}}, ρ[i, j]];
Repla =
  Solve[Flatten[Table[Sum[s[i, j] s[k, j], {j, na}] == r[k, i], {i, na}, {k, i}]],
    Flatten[Table[s[i, j], {i, na}, {j, i}]]][[2^na]];

Sqrt[Expand[Simplify[Sum[Sum[q[i] σ[i] s[i, j], {i, 1, na}]^2, {j, 1, na}] /. Repla]]]
```

$$\sqrt{\left(q[1]^2\,\sigma[1]^2+2\,q[1]\,q[2]\,\rho[1,2]\,\sigma[1]\,\sigma[2]+q[2]^2\,\sigma[2]^2+2\,q[1]\,q[3]\,\rho[1,3]\,\sigma[1]\,\sigma[3]+2\,q[2]\,q[3]\,\rho[2,3]\,\sigma[2]\,\sigma[3]+q[3]^2\,\sigma[3]^2+2\,q[1]\,q[4]\,\rho[1,4]\,\sigma[1]\,\sigma[4]+2\,q[2]\,q[4]\,\rho[2,4]\,\sigma[2]\,\sigma[4]+2\,q[3]\,q[4]\,\rho[3,4]\,\sigma[3]\,\sigma[4]+q[4]^2\,\sigma[4]^2\right)}$$

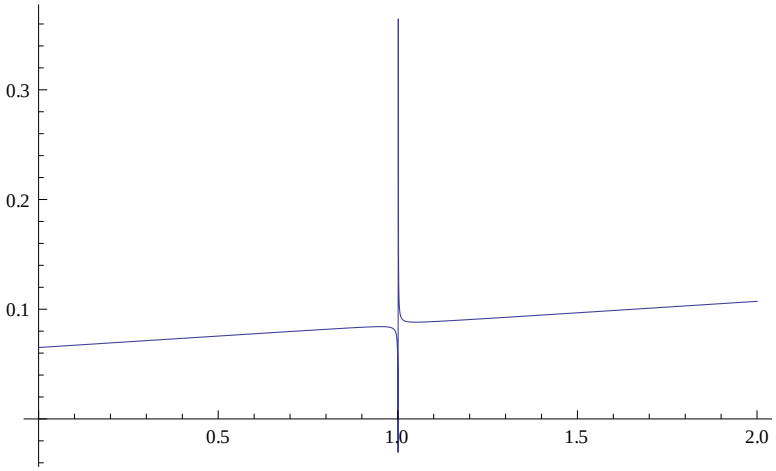
```
f = Simplify[Expand[q1^2 s1^2 + q2^2 s2^2 + 2 r s1 s2 q1 q2 /. q2 → 1 - q1]]
```

$$2\,q1\,(r\,s1-s2)\,s2+s2^2+q1^2\left(s1^2-2\,r\,s1\,s2+s2^2\right)$$

```
Simplify[{f /. q1 → 0, f /. q1 → 1, f /. Solve[D[f, q1] == 0, q1][[1, 1]]}]
```

$$\left\{s2^2,\ s1^2,\ -\frac{\left(-1+r^2\right)\,s1^2\,s2^2}{s1^2-2\,r\,s1\,s2+s2^2}\right\}$$

```
Plot[s1^2 - (-1 + r^2) s1^2 s2^2 / (s1^2 - 2 r s1 s2 + s2^2) /. s1 → 0.21 /. s2 -> 0.2, {r, 0, 2}, PlotRange → All]
```




```
s1^2 - (-1 + r^2) s1^2 s2^2 / (s1^2 - 2 r s1 s2 + s2^2) /. r → 1
```

$$s1^2$$