In[23]:=
```
(* These are the support vectors, one red and one blue with +1 & -1 respectivly
*)
r1 = {1, 1}
b1 = {0, 1}
b2 = {1, 0}
w = {w1, w2}
```

Out[23]= {1, 1}

Out[24]= {0, 1}

Out[25]= {1, 0}

Out[26]= {w1, w2}

In[27]:=
```
(* we have to solve for w and b subject to: y_i(w.x_i+b)=1 *)
(* We have 3 unknowns w1,w2 and b and we have 3
 support vectors so this is solving a system of equations *)
Solve[1 * (w.r1 + b) == 1 && -1 * (w.b1 + b) == 1 && -1 * (w.b2 + b) == 1, {w1, w2, b}]
```

Out[27]= {{w1 → 2, w2 → 2, b → -3}}

```
(*So we have the equation of the plane given by w.x+b=0 *)
```

In[48]:=
```
wmin = {2, 2}
b = -3
xi = {x1, x2}
wmin.xi + b == 0
```

Out[48]= {2, 2}

Out[49]= -3

Out[50]= $\{x_1, x_2\}$

Out[51]= $-3 + 2 x_1 + 2 x_2 == 0$

```
(*The maximum margin D is then as follows *)
```

In[53]:=
```
f[x_] = Abs[wmin.x + b] / Norm[wmin]
```

Out[53]= $\frac{\text{Abs}[-3 + \{2, 2\}.x]}{2\sqrt{2}}$

In[54]:=
```
f[r1]
```

Out[54]= $\frac{1}{2\sqrt{2}}$

In[55]:=
```
f[b1]
```

Out[55]= $\frac{1}{2\sqrt{2}}$

In[56]:=
```
f[b2]
```

Out[56]= $\frac{1}{2\sqrt{2}}$

```
(* This is the expected result based on our evaluation that the
 hyperplane lies evenly between these points, so all 3 maximize the
 margin and it must be so or else we have not maximized the margin! *)
```