ROC Curves

Your task is to use ROC curves to compare linear discriminant functions of the form

$$g_n(\vec{X}, \vec{w}) = \vec{w}_n^T \vec{X} \text{ using the notational convention } \vec{X} = \begin{pmatrix} 1 \\ x_1 \\ \vdots \\ x_D \end{pmatrix} \text{ and } \vec{w} = \begin{pmatrix} w_0 \\ w_1 \\ \vdots \\ w_D \end{pmatrix}.$$

Assume the following 3 discriminant functions: $\vec{w}_1 = \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} \quad \vec{w}_2 = \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} \vec{w}_3 = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$

Plot the ROC curves for each discriminant function using the following test data. Be sure to label each point with the bias value used for each point. Which discriminant function has the best performance for the test data.

y	x_1	x_2
1	0	1
1	2	0
1	2	1
1	2	2
1	3	2
-1	0	2
-1	0	3
-1	2	0
-1	2	3
-1	3	1