

**Part I**

1.  $y = -3x + 4$

a.  $\rightarrow y + 3x = 4 \rightarrow \mathbf{a} = \begin{pmatrix} 1 \\ 3 \end{pmatrix} \rightarrow \mathbf{a} \cdot \mathbf{x} = b \rightarrow \frac{1}{\| \begin{pmatrix} 1 \\ 3 \end{pmatrix} \|} \begin{pmatrix} 1 \\ 3 \end{pmatrix} \cdot \mathbf{x} = \frac{4}{\| \begin{pmatrix} 1 \\ 3 \end{pmatrix} \|} \rightarrow$

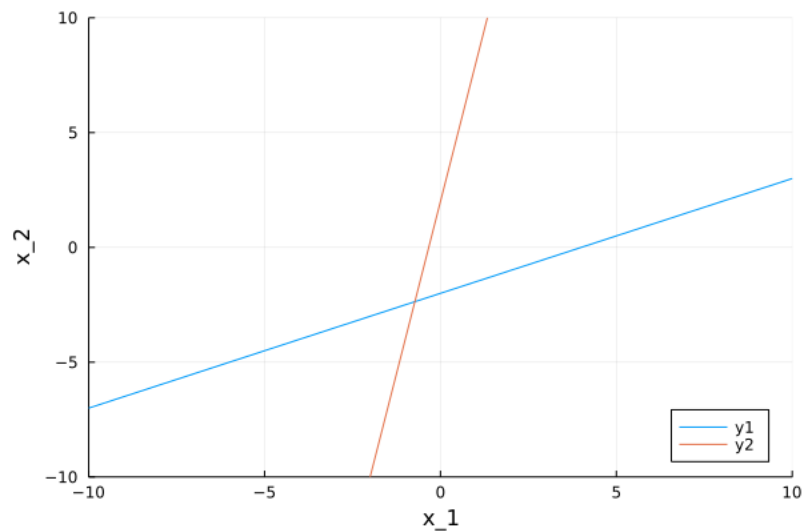
Unit vector normal =  $\begin{pmatrix} \frac{1}{\sqrt{10}} \\ \frac{3}{\sqrt{10}} \end{pmatrix} \approx \begin{pmatrix} 0.316 \\ 0.949 \end{pmatrix}$

b.  $\frac{4}{\sqrt{10}} \approx 1.265$

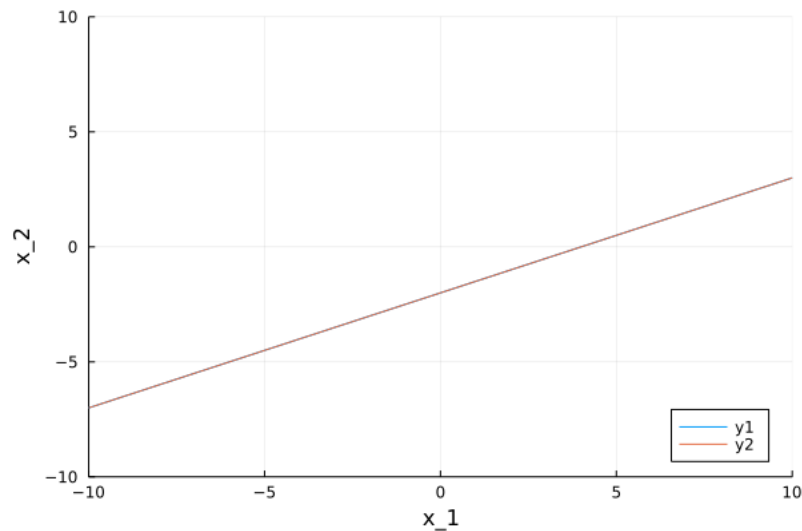
c.  $\begin{pmatrix} 6 \\ 5 \end{pmatrix}, \begin{pmatrix} 2 \\ 5 \end{pmatrix}$

2.

a.  $a = 0.5, b = 1$  (infinite solutions)



b.  $a = 6, b = -12$  (only solution)



c.  $a = 6, b = 0$  (a must equal 6 and b cannot equal -12)



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Properties, Methods
xval4 =
ClassificationPartitionedModel
  CrossValidatedModel: 'SVM'
  PredictorNames: {1×8750 cell}
  ResponseName: 'Y'
  NumObservations: 28
  KFold: 4
  Partition: [1×1 cvpartition]
  ClassNames: [-1 1]
  ScoreTransform: 'none'

Properties, Methods
ans = 0.2500
xval28 =
ClassificationPartitionedModel
  CrossValidatedModel: 'SVM'
  PredictorNames: {1×8750 cell}
  ResponseName: 'Y'
  NumObservations: 28
  KFold: 28
  Partition: [1×1 cvpartition]
  ClassNames: [-1 1]
  ScoreTransform: 'none'

Properties, Methods
ans = 0.2143

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ans = 0.2500	ans = 0.2143
ans = 0.1786	ans = 0.2143
ans = 0.2143	ans = 0.2143
ans = 0.2143	ans = 0.2143
ans = 0.2500	ans = 0.2143

4. 4-fold repeats:      Leave-one-out repeats:
- Accuracy changes depending on the method because when the number of groups,  $k$ , is smaller than the number of datapoints, there is stochasticity in the validation.

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5. P = table2array(patient_samples)';
TestResults = predict(M,P)
Patients 1 and 2 are predicted to have regular DC, and Patient 3 is predicted to have IDC.

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TestResults = 3×1
-1
-1
 1

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