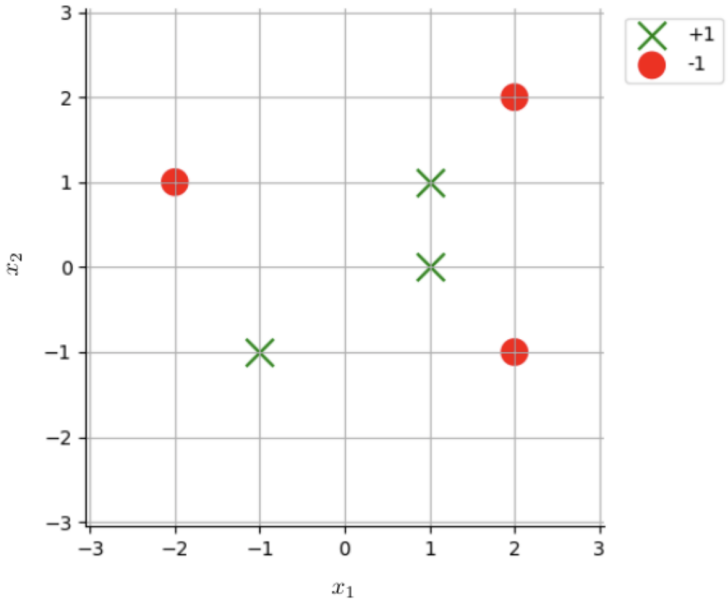
Name: _____

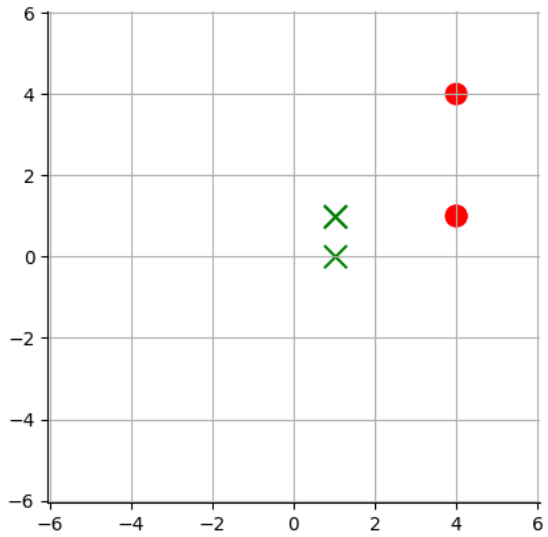
1 Linear classifier

1. (10 points) Consider the data in the plot below. The circles are negative and the X's are positive.



(a) Is the data linearly separable? ◯ Yes √ **No**

(b) Now, consider the feature transformation $\phi(x) = [x_1^2, x_2^2]$. Plot the points with feature transformation $\phi(x)$. Use circles for negative points and X's for positive ones.



(c) Is the data under feature transformation $\phi(x)$ linearly separable? √ **Yes** ◯ No

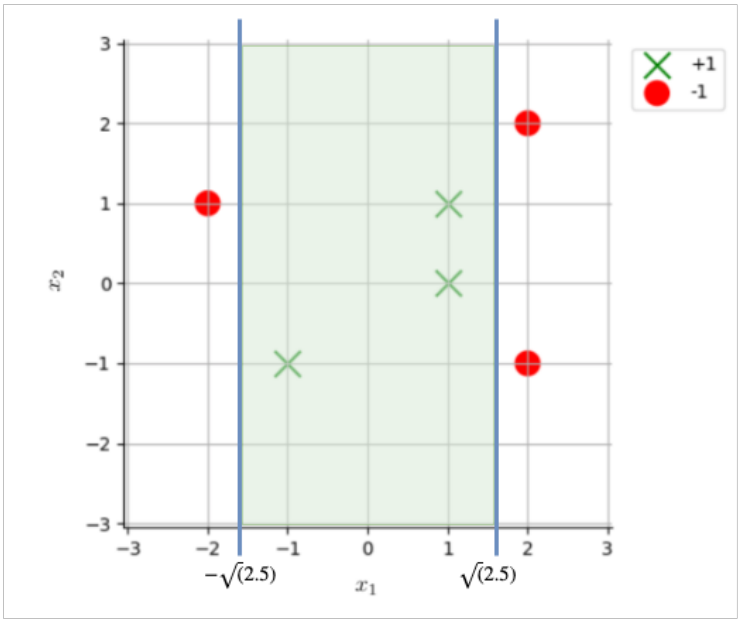
(d) Give θ and θ_0 values that define a linear separator of the *transformed* data.

- θ: $(-1, 0)$

- θ_0: 2.5

Note that there are many possible solutions to this problem.

(e) The linear separator that you just found above in the feature space corresponds to a non-linear separator in the original space. On the plot below (same as the first one), shade in the area *of the original space* that would be considered positive by the maximum-margin separator that you found in the feature space.



We checked for correctness relative to your answer to the previous part.