Let $A = \begin{bmatrix} 1 & 2 \\ -2 & 0 \\ 3 & 1 \end{bmatrix}$ and $\vec{\mathbf{b}} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

1. Show that $A\vec{\mathbf{x}} = \vec{\mathbf{b}}$ is inconsistent

2. (a) Use the Mathematica command *Orthogonalize[ ]* to find an orthogonal basis for col(A)

   (b) Use the Orthogonal Decomposition Theorem to find $\hat{\mathbf{b}}$, the projection of $\vec{\mathbf{b}}$ onto col(A)

   (c) Verify that $\vec{\mathbf{z}} = \vec{\mathbf{b}} - \hat{\mathbf{b}}$ is orthogonal to both columns of A.

3. Solve $A\vec{\mathbf{x}} = \hat{\mathbf{b}}$

Consider the following data points:

x	-2	-1	1	2	4
y	-43	-2	2	-11	-187

4. Show that there is no cubic polynomial $p(t) = a_0 + a_1 t + a_2 t^2 + a_3 t^3$ that passes through all of these points.

5. Find the best-fit cubic $\hat{p}(t)$

6. Graph the points and $\hat{p}(t)$ to verify your answer