**Supplemental problems: §1.2, §1.3**

**1.** Is the matrix below in reduced row echelon form?

$$\left(\begin{array}{cccc|c} 1 & 1 & 0 & -3 & 1 \\ 0 & 0 & 1 & -1 & 5 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right)$$

**2.** Put an augmented matrix into reduced row echelon form to solve the system

$$\begin{aligned} x_1 - 2x_2 - 9x_3 + x_4 &= 3 \\ 4x_2 + 8x_3 - 24x_4 &= 4. \end{aligned}$$

**3.**

**a)** Row reduce the following matrices to reduced row echelon form.

**b)** If these are augmented matrices for a linear system (with the last column being after the = sign), then which are inconsistent? Which have a *unique* solution?

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 5 & 6 & 7 \\ 6 & 7 & 8 & 9 \end{pmatrix} \qquad \begin{pmatrix} 1 & 3 & 5 & 7 \\ 3 & 5 & 7 & 9 \\ 5 & 7 & 9 & 1 \end{pmatrix} \qquad \begin{pmatrix} 3 & -4 & 2 & 0 \\ -8 & 12 & -4 & 0 \\ -6 & 8 & -1 & 0 \end{pmatrix}$$

**4.** We can use linear algebra to find a polynomial that fits given data, in the same way that we found a circle through three specified points in the §1.2 Webwork.

Is there a degree-three polynomial $P(x)$ whose graph passes through the points $(-2,6)$, $(-1,4)$, $(1,6)$, and $(2,22)$? If so, how many degree-three polynomials have a graph through those four points? We answer this question in steps below.

**a)** If $P(x) = a_0 + a_1 x + a_2 x^2 + a_3 x^3$ is a degree-three polynomial passing through the four points listed above, then $P(-2) = 6$, $P(-1) = 4$, $P(1) = 6$, and $P(2) = 22$. Write a system of four equations which we would solve to find $a_0$, $a_1$, $a_2$, and $a_3$.

**b)** Write the augmented matrix to represent this system and put it into reduced row-echelon form. Is the system consistent? How many solutions does it have?