1.1

a)

Floating point values are always an approximation to the real number. When you add two floating point numbers together, there will be a slight deviation due to the limited precision of a 32 bit floating point number. This will lead to rounding errors.

b)

I would compare the difference between the result value and the correct value and compare it to a tolerance value (t). If the difference is smaller than the t, we deem it sufficiently accurate.

1.2

a)

$$
\begin{array}{rrrr|l}
6 & -10 & 14 & 16 & (1) \\
-9 & 6 & -3 & -6 & (2) \\
-3 & 3 & -2 & -3 & (3) \\
\hline
-9 & 6 & -3 & -6 & (4) \\
6 & -10 & 14 & 16 & (5) \\
-3 & 3 & -2 & -3 & (6) \\
\hline
-9 & 6 & -3 & -6 & (7) \\
0 & -6 & 12 & 12 & (8) = (5) + \frac{2}{3}(4) \\
0 & 1 & -1 & -1 & (9) = (6) - \frac{1}{3}(4) \\
\hline
-9 & 6 & -3 & -6 & (10) \\
0 & -6 & 12 & 12 & (11) \\
0 & 0 & 1 & 1 & (12) = (9) + \frac{1}{6}(8) \\
\hline
-9 & 6 & 0 & -3 & (13) = (10) + 3 \cdot (12) \\
0 & -6 & 0 & 0 & (14) = (11) - 12 \cdot (12) \\
0 & 0 & 1 & 1 & (15) \\
\hline
-9 & 0 & 0 & -3 & (16) = (13) + (14) \\
0 & 1 & 0 & 0 & (17) = -\frac{1}{6} \cdot (14) \\
0 & 0 & 1 & 1 & (18) \\
\hline
1 & 0 & 0 & \frac{1}{3} & (19) = -\frac{1}{9}(16) \\
0 & 1 & 0 & 0 & (20) \\
0 & 0 & 1 & 1 & (21)
\end{array}
$$

$$\rightarrow \underline{\underline{x_1 = \frac{1}{3},\ x_2 = 0,\ x_3 = 1}}$$

b)

$$
T(x) = Ax = \begin{pmatrix} 2 & 4 & 0 & 1 & 3 \\ 0 & 1 & -2 & 2 & 1 \\ 5 & 7 & 1 & -5 & 6 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{pmatrix} = \underline{\underline{\begin{pmatrix} 2x_1 + 4x_2 + x_4 + 3x_5 \\ x_2 - 2x_3 + 2x_4 + x_5 \\ 5x_1 + 7x_2 + x_3 - 5x_4 + 6x_6 \end{pmatrix}}}
$$

The input Vector x modifies the matrix A by multiplying of x by the coefficients in A and adding them together in each row.