Reflection Questions

1. In each of the following cases, you are given a point P and a line. Determine the point Q on the line that represents the shortest distance from P to the line. Then, determine the coordinates of the image point R that represents the reflection of point P in the line.
   a) $P(30,-56,-23)$ $L: \vec{r} = \overrightarrow{(8,-5,2)} + t\,\overrightarrow{(4,4,-3)}, t \in R$
   b) $P(47,-83,-54)$ $L: \vec{r} = \overrightarrow{(2,-8,-3)} + t\,\overrightarrow{(2,-1,5)}, t \in R$
   c) $P(17,-11,-3)$ $L: \vec{r} = \overrightarrow{(-3,1,5)} + t\,\overrightarrow{(2,-1,3)}, t \in R$
   d) $P(16,-35,-22)$ $L: \vec{r} = \overrightarrow{(-4,-8,-5)} + t\,\overrightarrow{(1,3,-1)}, t \in R$

Answers:

a) Q (4, -9, 5) and R (-22, 38, 33)
b) Q (-4, -5, -18) and R (-55, 73, 18)
c) Q (1, -1, 11) and R (-15, 9, 25)
d) Q (-8, -20, -1) and R (-32, -5, 20)

2. In each of the following cases, you are given a point P and a plane. Determine the point Q on the plane that represents the shortest distance from P to the plane. Then, determine the coordinates of the image point R that represents the reflection of point P in the plane.
   a) $P(14,-10,18)$ $\pi: 4x - 2y + 3z - 43 = 0$
   b) $P(17,14,-61)$ $\pi: 5x + y - 12z + 19 = 0$
   c) $P(-6,-11,-1)$ $\pi: \vec{r} = \overrightarrow{(8,-9,2)} + s\,\overrightarrow{(2,-1,4)} + t\,\overrightarrow{(7,4,8)}, s \in R, t \in R$

Answers:

a) Q (2, -4, 9) and R (-10, 2, 0)
b) Q (-8, 9, -1) and R (-33, 4, 59)
c) Q (2, -7, -6) and R (10, -3, -11)