**Problem 1.** A vector parallel to the line is given by (1,5,2) - (3,4,-1) = (-2,1,3). Hence the vector equation is

$$\boldsymbol{r} = (1, 5, 2) + (-2, 1, 3)t$$

Then a symmetric equation of this line is

$$\frac{x-1}{-2} = \frac{y-5}{1} = \frac{z-2}{3}$$

Problem 2.

(a)

$$\overrightarrow{PQ} = (3,2,5) - (2,0,5) = (1,2,0)$$
  
$$\overrightarrow{PR} = (2,3,4) - (2,0,5) = (0,3,-1)$$

(b) A vector that is perpendicular to both is

$$\overrightarrow{PQ} \times \overrightarrow{PR} = \begin{vmatrix} \hat{\imath} & \hat{j} & \hat{k} \\ 1 & 2 & 0 \\ 0 & 3 & -1 \end{vmatrix} = -2\hat{\imath} + \hat{\jmath} + 3\hat{k}$$

(c) An equation of the plane containing P, Q and R is

$$\begin{array}{rl} -2(x-2)+y+3(z-5)=0\\ \Rightarrow & -2x+4+y+3z-15=0\\ \Rightarrow & -2x+y+3z=11 \end{array}$$