4. A 3D object, O, can be viewed from a position $\mathbf{p}$ by looking in direction $\mathbf{v}$.

(a) Sketch the viewing geometry giving all parameters required to map the object on to a view plane. [5]

(b) If a viewport on the view plane has size $W \times H$, what 3D and 2D transformations are required to project vertices of O ensuring that those inside the viewport are in the range $[0, 1]$? [6]

(c) How can the edges of the object be efficiently clipped to the viewport using the Sutherland-Cohen method? Illustrate your answer with three typical cases. [7]

(d) Write down the set of inequalities for the line $(x_1, y_1) \rightarrow (x_2, y_2)$ which are necessary to set up the Liang-Barsky clipping algorithm on a normalised viewport. State the parameter values for intersections of the line with the four edges of the viewport. [7]