4.

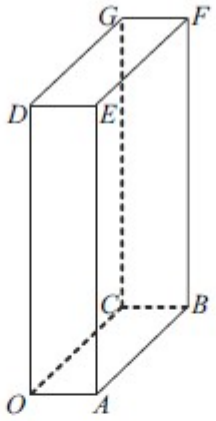

Figure 1

Figure 1 shows a cuboid $OABCDEFG$, where O is the origin, A has position vector $5\mathbf{i}$, C has position vector $10\mathbf{j}$ and D has position vector $20\mathbf{k}$.

(a) Find the cosine of angle CAF.

(4)

Given that the point X lies on AC and that FX is perpendicular to AC,

(b) find the position vector of point X and the distance FX.

(7)

The line l_1 passes through O and through the midpoint of the face $ABFE$. The line l_2 passes through A and through the midpoint of the edge FG.

(c) Show that l_1 and l_2 intersect and find the coordinates of the point of intersection.

(5)