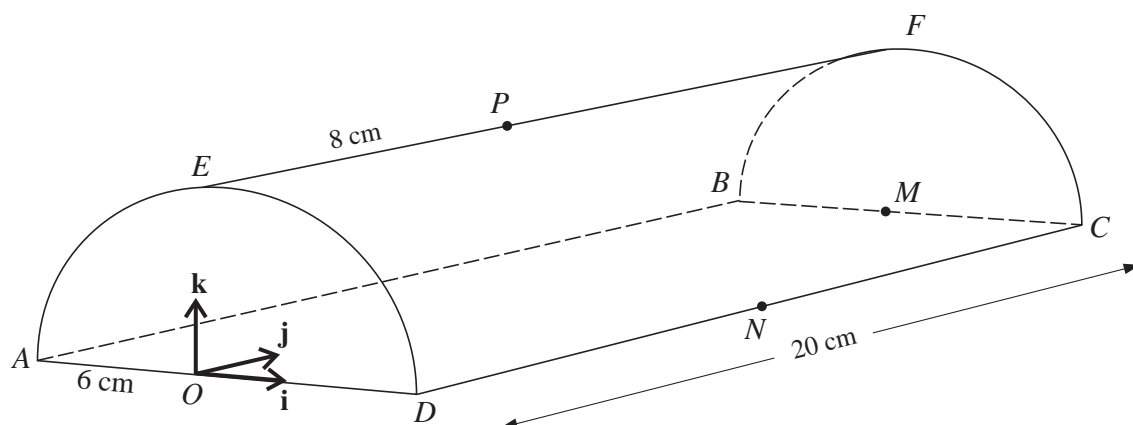


4



The diagram shows a semicircular prism with a horizontal rectangular base $ABCD$. The vertical ends AED and BFC are semicircles of radius 6 cm. The length of the prism is 20 cm. The mid-point of AD is the origin O , the mid-point of BC is M and the mid-point of DC is N . The points E and F are the highest points of the semicircular ends of the prism. The point P lies on EF such that $EP = 8$ cm.

Unit vectors \mathbf{i} , \mathbf{j} and \mathbf{k} are parallel to OD , OM and OE respectively.

(i) Express each of the vectors \overrightarrow{PA} and \overrightarrow{PN} in terms of \mathbf{i} , \mathbf{j} and \mathbf{k} . [3]

(ii) Use a scalar product to calculate angle APN . [4]