11. (a) Obtain the matrix, $A$, associated with an anticlockwise rotation of $\frac{\pi}{3}$ radians about the origin.

(b) Find the matrix, $B$, associated with a reflection in the $x$-axis.

(c) Hence obtain the matrix, $P$, associated with an anticlockwise rotation of $\frac{\pi}{3}$ radians about the origin followed by reflection in the $x$-axis, expressing your answer using exact values.

(d) Explain why matrix $P$ is not associated with rotation about the origin.

Answers

(a) \[
\begin{bmatrix}
\cos \frac{\pi}{3} & -\sin \frac{\pi}{3} \\
\sin \frac{\pi}{3} & \cos \frac{\pi}{3}
\end{bmatrix}
\]

(b) \[
\begin{bmatrix}
1 & 0 \\
0 & -1
\end{bmatrix}
\]

(c) \[
\frac{1}{2}\begin{bmatrix}
1 & -\sqrt{3} \\
-\sqrt{3} & -1
\end{bmatrix}
\]

(d) Compare the elements of $P$

with the general form of a

rotation matrix