Step-1

If A is positive definite then,

$\Rightarrow x^T Ax > 0$ for any $x \neq 0$ â€¦â€¦ (1)

If B is positive definite then,

$\Rightarrow x^T Bx > 0$ for any $x \neq 0$ â€¦â€¦ (2)

Step-2

Now for $x \neq 0$,

$$x^T (A+B)x = x^T Ax + x^T Bx$$
$$> 0 \qquad (\text{using (1) and (2)})$$

Thus $x^T (A+B)x > 0$ for $x \neq 0$.

Therefore, $A+B$ is also positive definite.