

STEP/Inequalities Q1 (20/6/23)

Are the following true or false?

(i) $a < b \Rightarrow \frac{1}{a} > \frac{1}{b}$

(ii) $a < b \Rightarrow a^2 < b^2$

(iii) $a < b \ \& \ c < d \Rightarrow a + c < b + d$

(iv) $a < b \ \& \ c < d \Rightarrow a - c < b - d$

Solution

(i) Not true if $a < 0$ & $b > 0$ (consider the graph of $y = 1/x$)

(ii) Not true if $a < 0$ & $b < 0$ or

if $a < 0, b > 0$ & $|b| < |a|$ (consider the graph of $y = x^2$)

(iii) True: $a < b \Rightarrow a + c < b + c < b + d$

(iv) False: For example, $8 < 9$ and $2 < 4$, but it is not true that $8 - 2 < 9 - 4$; see diagram

