POSITION OF TWO POINTS RELATIVE TO A LINE

Let us consider two points $A = (X_1, Y_1)$, $B = (X_2, Y_2)$, and the line $ax + by + c = 0$ and $S_1 = ax + by + c$, $S_2 = ax_2 + by_2 + C$.

1.   If $S_1 = 0$ and $S_2 = 0$, then both points lie on the line.
2.   If $S_1 S_2 > 0$, then both points lie on the same side of the line.
3.   If $SS_2 < 0$, then points lie on the opposite side of the line.

Ex.   Find the value of a if (a, a) and $(-a, -a)$ lies in same side of the line, $x + y + 2 = 0$.

Sol.   For same side

$$(a + a + 2)(-a - a + 2) > 0$$
$$(a + 1)(-a + 1) > 0$$
$$(a + 1)(a - 1) < 0$$
$$a \in (-1.1)$$