36) Question: For what value of "y" is the function "f" undefined?

$$f(y) = \frac{1}{(y-15)^2 + 10(y-15) + 16}$$

For speed, while solving something similar, only THINK the words in blue; WRITE only the words in other COLORS.
_{nc}

Given: 1)   a function f(y).
Solve: Find the value of the variable "y" for which the function f(y) is undefined.

Road Map of Solution:
First   Step: Is to understand when is a function undefined.
*   i.e. the RHS of the above equation is "infinity".*
*   That happens when the RHS is $= \frac{1}{0}$*
Second Step: Equate the denominator on the RHS to Zero and solve the equation.

First   Step: $f(y) = \frac{1}{(y-15)^2 + 10(y-15) + 16}$ . . . .   *equation # 1*

*   is undefined when*

* $f(y) = \infty = \frac{1}{0}$*

The above is true when
$$(y - 15)^2 + 10(y - 15) + 16 = 0$$ . . . .   *equation # 2*

To make it easier to solve, we will substitute.
Substituting $(y - 15) = z$ . . . .   *equation # 3*
in equation # 2.
We get,
$$(z\quad)^2 + 10(z\quad) + 16 = 0$$ . . . .   *equation # 2b*

In eq#2b, 1 & 16 are the coefficient of the 1ˢᵗ & 3ʳᵈ expressions.   1×16 = 16
*   = 16×1 or*
*   = 8×2*

$$(z)^2 + 8(z) + 2(z) + 16 = 0$$

$$(z)^2 + 8(z) + 2(z) + 16 = 0$$

$$(z)(z + 8) + 2(z + 8) = 0$$

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$$(z + 2) \times (z + 8) = 0$$ . . . .   *equation # 2c*

So, for equation # 2c to be true,
Either (z   + 2) =   0
*   (y − 15 + 2) =   0*
*   (y − 13)   =   0*
*   y   =   13*
OR
*   (z   + 8) =   0*
*   (y − 15 + 8) =   0*
*   (y − 7)   =   0*
*   y   =   7*

Answer: The function "f" is undefined for y = 13 or y = 7