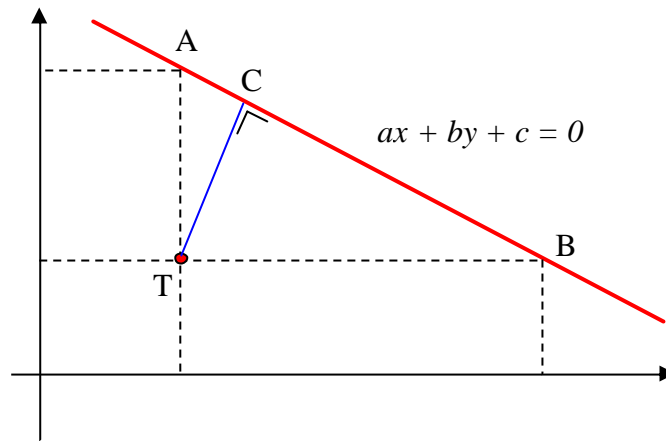


Rumus Jarak Titik dan Garis



Misalkan titik $T(x_1, y_1)$ dan $A(x_A, y_A)$

(1). $x_A = x_1$

(2). A pada garis $ax + by + c = 0$, maka :

$$\Rightarrow ax_1 + by_A + c = 0$$

$$\Rightarrow by_A = -ax_1 - c$$

$$\Rightarrow y_A = \frac{-ax_1 - c}{b}$$

sehingga $A\left(x_1, \frac{-ax_1 - c}{b}\right)$

Misalkan titik $B(x_B, y_B)$

(1). $y_B = y_1$

(2). B pada garis $ax + by + c = 0$, maka :

$$\Rightarrow ax_A + by_1 + c = 0$$

$$\Rightarrow ax_A = -by_1 - c$$

$$\Rightarrow x_A = \frac{-by_1 - c}{a}$$

sehingga $B\left(\frac{-by_1 - c}{a}, y_1\right)$

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Panjang AT, BT, dan AB adalah:

$$\bullet AT = y_A - y_1 = \frac{-ax_1 - c}{b} - y_1 = \frac{-ax_1 - by_1 - c}{b}$$

$$\bullet BT = x_B - x_1 = \frac{-by_1 - c}{a} - x_1 = \frac{-ax_1 - by_1 - c}{a}$$

$$\begin{aligned} \bullet AB &= \sqrt{(x_A - x_B)^2 + (y_A - y_B)^2} \\ &= \sqrt{\left(x_1 - \left(\frac{-by_1 - c}{a}\right)\right)^2 + \left(\left(\frac{-ax_1 - c}{b}\right) - y_1\right)^2} \\ &= \sqrt{\left(\frac{ax_1 + by_1 + c}{a}\right)^2 + \left(\frac{-ax_1 - by_1 - c}{b}\right)^2} \\ &= \sqrt{\frac{(ax_1 + by_1 + c)^2}{a^2} + \frac{(ax_1 + by_1 + c)^2}{b^2}} \\ &= (ax_1 + by_1 + c) \sqrt{\frac{1}{a^2} + \frac{1}{b^2}} \\ &= (ax_1 + by_1 + c) \sqrt{\frac{a^2 + b^2}{a^2 b^2}} \\ &= \frac{1}{ab} (ax_1 + by_1 + c) \sqrt{a^2 + b^2} \end{aligned}$$

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Luas segitiga ABT adalah

$$\begin{aligned} L &= \frac{1}{2} AT \cdot BT \\ &= \frac{1}{2} \left(\frac{-ax_1 - by_1 - c}{b}\right) \left(\frac{-ax_1 - by_1 - c}{a}\right) \\ &= \frac{1}{2ab} (ax_1 + by_1 + c)^2 \dots\dots\dots(1) \text{ atau} \end{aligned}$$

$$\begin{aligned}
L &= \frac{1}{2} AB \cdot CT \\
&= \frac{1}{2} \left(\frac{1}{ab} (ax_1 + by_1 + c) \sqrt{a^2 + b^2} \right) CT \\
&= \frac{1}{2ab} (ax_1 + by_1 + c) \sqrt{a^2 + b^2} \cdot CT \dots\dots\dots(2)
\end{aligned}$$

Dari (1) dan (2), kita peroleh:

$$\begin{aligned}
\frac{1}{2ab} (ax_1 + by_1 + c)^2 &= \frac{1}{2ab} (ax_1 + by_1 + c) \sqrt{a^2 + b^2} \cdot CT \\
\Rightarrow (ax_1 + by_1 + c) &= \sqrt{a^2 + b^2} \cdot CT \\
\Rightarrow CT &= \frac{(ax_1 + by_1 + c)}{\sqrt{a^2 + b^2}}
\end{aligned}$$

CT adalah jarak titik T dengan garis $ax + by + c = 0$. Karena jarak tidak pernah bernilai negatif, maka dapat disimpulkan bahwa:

Jarak titik $T(x_1, y_1)$ dengan garis $ax + by + c = 0$ adalah:

$$d = \left| \frac{(ax_1 + by_1 + c)}{\sqrt{a^2 + b^2}} \right|$$

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Et Ut G2

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