**Shortest Distance from a Point to a Line**

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| * Given the point we can draw infinite different lines to the line but…
* The shortest distance is the line that hits it at a 0
* The shortest distance from a point to a line is the distance from the point to your line.
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**METHOD 1: Finding the Shortest Distance Graphically**

**Ex1.** Find the shortest distance **graphically** between the point $(-4,-3)$ and the equation $y=-2x+4$.



**METHOD 2: Finding the Shortest Distance Algebraically**

**Ex2.** Find the shortest distance from the point $C(4,-2)$ to the line passing through the points $A\left(1,3\right) and B\left(-4,-2\right).$

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| **Step 1** Find equation of the line AB.**Step 2** Draw a line perpendicular to AB that goes through C. Let the point on AB be called D. Find the equation of the line CD.**Step 3** Find D, the POI of AB and CD (substitution or elimination).**Step 4** Find the length of CD. |

**Practice**

**Ex3.** Determine the shortest distance **graphically** from $A(3,-1)$ to the line$ 2x-y+3=0$.



**Ex4**: **Algebraically** determine the shortest distance from the point $P(5,2)$ to the line passing through the points $R\left(-6 ,4\right) and S\left(-2, -4\right).$

**Ex 5**.Triangle $ABC$ has vertices$ A(3,4)$, $B(-5,2),$ and $C\left(1,-4\right).$ Determine an equation for $AE$, the **altitude** from $A $to $BC$. What is the area of triangle$ ABC$?

An altitude of a triangle is .