Straight line on a plane

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Task

The coordinates apexes of a triangle **ABC** are given as

$$A(-2,-2) \qquad B(4,1) \qquad C(0,4)$$

Using methods of the analytical geometry do the following:

1) find the distance between point A and point B ;

1) find the distance between point *A* and point B

$$AB = \sqrt{(x_B - x_A)^2 + (y_B - y_A)^2} = \sqrt{(4 - (-2))^2 + (1 - (-2))^2} =$$

$$= \sqrt{(4 + 2)^2 + (1 + 2)^2} = \sqrt{6^2 + 3^2} = \sqrt{36 + 9} = \sqrt{45} = 3\sqrt{5}$$

Task

The coordinates apexes of a triangle **ABC** are given as

$$A(-2,-2) \qquad B(4,1) \qquad C(0,4)$$

Using methods of the analytical geometry do the following:

2) form equation of the sides AB and AC ;

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$$\frac{y - y_A}{y_B - y_A} = \frac{x - x_A}{x_B - x_A}$$

$$\frac{y - y_A}{y_C - y_A} = \frac{x - x_A}{x_C - x_A}$$

$$\frac{y - (-2)}{1 - (-2)} = \frac{x - (-2)}{4 - (-2)}$$

$$\frac{y - (-2)}{4 - (-2)} = \frac{x - (-2)}{0 - (-2)}$$

$$y = \frac{1}{2}x - 1 \qquad k_{AB} = \frac{1}{2}$$

$$y = 3x + 4 \qquad k_{AC} = 3$$

Task

The coordinates apexes of a triangle **ABC** are given as

$$A\left(-2,-2\right) \qquad B\left(4,1\right) \qquad C\left(0,4\right)$$

Using methods of the analytical geometry do the following:

3) form equation of the altitude dropped from the apex C

3) form equation of the altitude CN dropped from the apex C

$$y - y_C = k_{CN}(x - x_C)$$

$$k_{CN} \cdot k_{AB} = -1$$

$$k_{CN} = -\frac{1}{k_{AB}}$$

$$k_{AB} = \frac{1}{2}$$

$$y - 4 = -\frac{1}{1/2}(x - 0)$$

$$y = -2x + 4$$

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Task

The coordinates apexes of a triangle **ABC** are given as

$$A(-2,-2) \qquad B(4,1) \qquad C(0,4)$$

Using methods of the analytical geometry do the following:

4) find the inner angle of the triangle at the apex A;

4) find the inner angle of the triangle at the apex A

$$tg\,\alpha = \left|\frac{k_{AC} - k_{AB}}{1 + k_{AC} \cdot k_{AB}}\right| = \left|\frac{3 - 1/2}{1 + 3 \cdot 1/2}\right| = \left|\frac{5/2}{5/2}\right| = 1$$

$$\alpha = arctg\,1 = \frac{\pi}{4}$$

Task

The coordinates apexes of a triangle **ABC** are given as

$$A(-2,-2) \qquad B(4,1) \qquad C(0,4)$$

Using methods of the analytical geometry do the following:

5) calculate length of the altitude CN dropped from the apex C;

5) calculate length of the altitude CN dropped from the apex C

$$y = \frac{1}{2}x - 1 \qquad\qquad x - 2y - 1 = 0$$

$$C(0,4)$$

$$CN = \frac{\left| x_C - 2 \cdot y_C - 2 \right|}{\sqrt{1^2 + (-2)^2}} = \frac{\left| 0 - 2 \cdot 4 - 2 \right|}{\sqrt{1+4}} = \frac{\left| 0 - 8 - 2 \right|}{\sqrt{5}} = \frac{10}{\sqrt{5}}$$

Task

The coordinates apexes of a triangle **ABC** are given as

$$A(-2,-2) \qquad B(4,1) \qquad C(0,4)$$

Using methods of the analytical geometry do the following:

6) find the area of the triangle ABC;

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$$S_{\Delta ABC} = \frac{1}{2} AB \cdot CN = \frac{1}{2} \cdot 3\sqrt{5} \cdot \frac{10}{\sqrt{5}} = 15$$

Task

The coordinates apexes of a triangle **ABC** are given as

$$A(-2,-2) \qquad B(4,1) \qquad C(0,4)$$

Using methods of the analytical geometry do the following:

7) form equation of the median CM dropped from the apex C;

7) form equation of the median CM dropped from the apex C

$$x_M = \frac{x_A + x_B}{2} = \frac{-2+4}{2} = \frac{2}{2} = 1$$

$$y_M = \frac{y_A + y_B}{2} = \frac{-2+1}{2} = -\frac{1}{2}$$

$$\frac{y - y_M}{y_C - y_M} = \frac{x - x_M}{x_C - x_M}$$

$$\frac{y - \left(-\dfrac{1}{2}\right)}{4 - \left(-\dfrac{1}{2}\right)} = \frac{x - 1}{0 - 1}$$

$$y = -\frac{9}{2}x + 4$$

Task

The coordinates apexes of a triangle **ABC** are given as
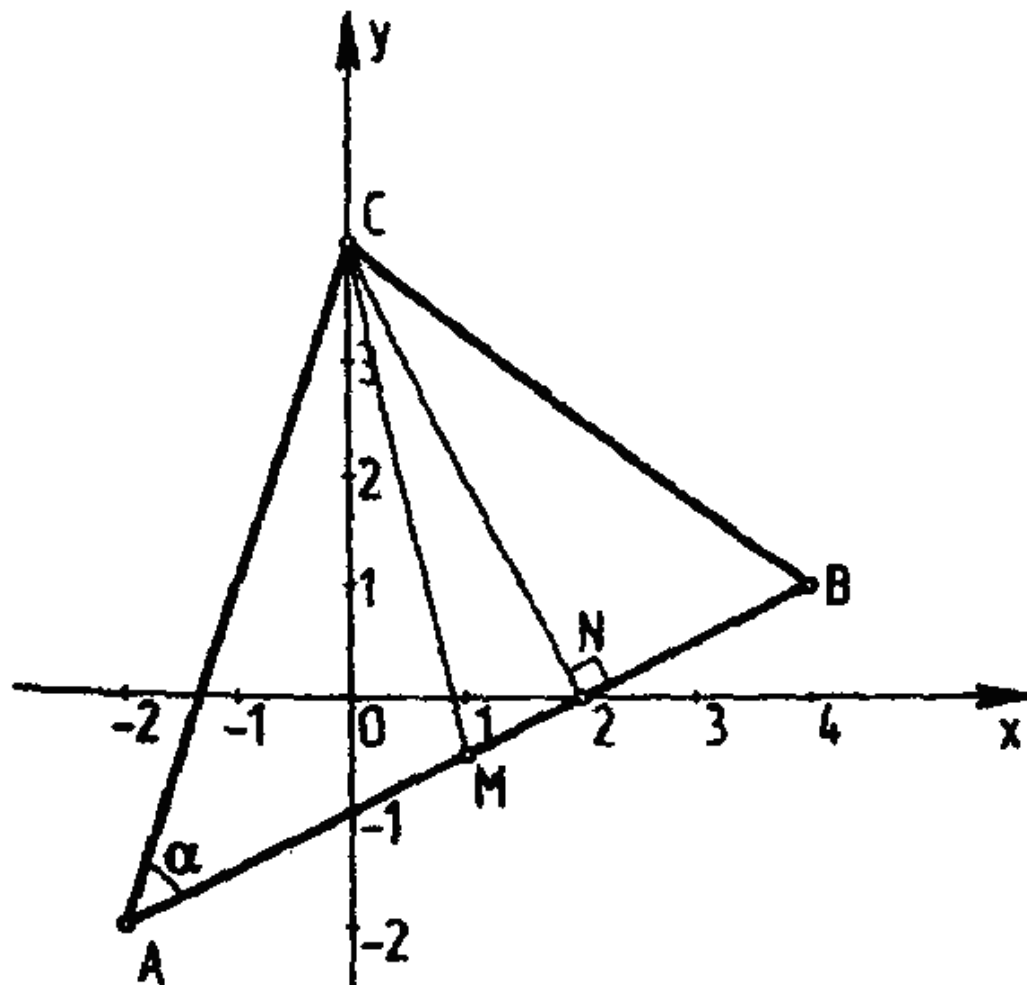
$$A(-2, -2) \qquad B(4,1) \qquad C(0,4)$$

Using methods of the analytical geometry do the following:

8) draw the triangle ABC

8) the picture