Question: Given triangle $A B C$ has vertices at $(-2,4),(-2,-4)$ and $(0,-2)$, respectively, find the circumcenter of the triangle.

## Solution:

The circumcenter of the triangle $A B C$ is the intersection of perpendicular bisectors. So we need to find equations of at least two perpendicular bisectors and find their intersection.
First, let's calculate the midpoint of sides $A B$ and $B C$ which is the average of the $x$ and $y$ coordinates.
Midpoint of $A B$ :

$$
\begin{aligned}
& x=(-2-2) / 2=-2 \\
& y=(4-4) / 2=0 \\
& (-2,0)
\end{aligned}
$$

Midpoint of $B C$ :

$$
\begin{aligned}
& x=-2 / 2=-1 \\
& y=(-4-2) / 2=-3 \\
& (-1,-3)
\end{aligned}
$$

Then we need to find the slope of $A B$ and $B C$ using the formula ( $y 2-y 1) /(x 2-x 1)$
$A B$ is a vertical line, so the slope of its perpendicular bisector is 0 .
Slope of $B C$ : $m=(-2+4) / 2=1$
The slope of the perpendicular bisector of $B C$ is $-1 / 1=-1$

Next, we need to find equations of the perpendicular bisectors of the lines $A B$ and $B C$ using the formula $y-y 1=m(x-x 1)$
For $A B$ with midpoint $(-2,0)$ and slope $0: \quad y=0$
For $B C$ with midpoint $(-1,-3)$ and slope -1 :
$y+3=-x-1$
$x+y+4=0 \quad$ (2)
Solving equations (1) and (2) we get values $x=-4, y=0$ which are the coordinates of the circumcenter of the triangle $A B C$.
Answer: (-4,0)
Answer provided by https://www.AssignmentExpert.com

