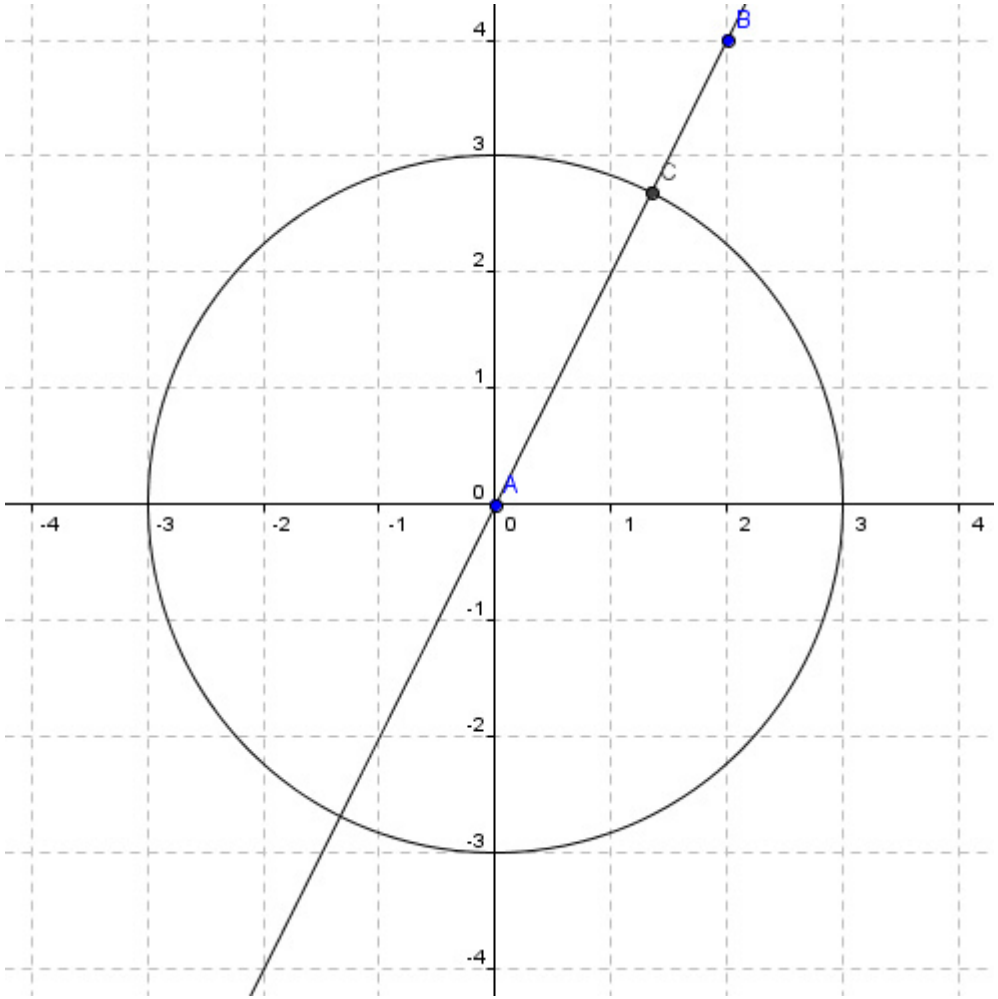
Closest point on circle edge from point outside/inside the circle

Alright, I am programming a plugin for a game that requires me to get the closest point on a circle when all you have is a point B, which is outside of the circle, the radius of the circle, and the location of the center of the circle.

Say I have this situation:



So, how would I be able to get the coordinates of point C? I need a formula that allows me to calculate those coordinates when I only know the radius of the circle and the coordinates of B. I sketched the line for ease of understanding, but all I start with is just the circle and point B. OH, one other thing, B isn't a static point, each time this calculation will be executed B will be at another position.

And, as a bonus (not really needed) would you care to show an example on how to do the same thing, but then when point B is inside the circle.

Solution

$$\vec{C} = \vec{A} + r\frac{(\vec{B} - \vec{A})}{||\vec{B} - \vec{A}||}$$

Where r is the radius of the circle. Works for points both inside and outside the circle. Imagine $(\vec{B} - \vec{A})$ to be a vector in the direction of $\vec{B}$ and $\frac{(\vec{B}-\vec{A})}{||\vec{B}-\vec{A}||}$ thus is the same vector but with a length of 1. By multiplying it with r, you "walk in that direction" a total distance of r, thus reaching the circle.

With coordinats $\vec{A} = (A_x, A_y)$ etc. this reads

$$C_x = A_x + r\frac{B_x - A_x}{\sqrt{(B_x - A_x)^2 + (B_y - A_y)^2}}$$

$$C_y = A_y + r\frac{B_y - A_y}{\sqrt{(B_x - A_x)^2 + (B_y - A_y)^2}}$$