MATH 202, Fall 2023 **Name:** _____
In class work 25 **Row and Seat**: _____

In class work **25** has questions **1** through **1** with a total of **6** points. Turn in your work at the end of class *on paper*. This assignment is due at *Thursday 30 November 13:20*.

"Time is never wasted if you remember to bring along something to read."

THOMAS PYNCHON

1. In polar coordinates, an equation of a curve $\mathscr{C}$ is $r = \sqrt{\frac{1}{4} - \sin(\theta)^2}$.

[2] (a) Use Desmos to draw a graph of this polar equation. As best you can, reproduce the graph here.

[2] (b) Find all solutions to $0 = \sqrt{\frac{1}{4} - \sin(\theta)^2}$. These solutions give all the points on the curve that intersect the origin with $\theta \in [0, 2\pi]$. To find *all* solutions to this equation, use the *source of all knowledge* (**SOAK**), that is, the unit circle.

2 (c) For each intersection of $\mathscr{C}$ with the origin, find the slope of the tangent line. Using Desmos, verify that you have found the correct tangent lines. **Note:** Desmos refuses[1] to graph a polar curve of the form $\theta = f(r)$. And it particular, it will not graph the polar curve $\theta = \frac{\pi}{4}$, for example. To workaround this, you'll need to find the cartesian equation of the tangent lines.

Optional For extra fun, find a cartesian equation of the curve $\mathscr{C}$. Show that for $x \in [-\frac{1}{2}, \frac{1}{2}]$, a cartesian equation of the curve is $y = \pm\frac{\sqrt{\sqrt{64x^2+9}-8x^2-3}}{2^{\frac{3}{2}}}$. And show that the other two solutions are not real. Finally, are there any values of x that allow the nested radical $\sqrt{\sqrt{64x^2+9}-8x^2-3}$ to denest?

[1] I think Desmos should hire some UNK CS graduates to fix this.