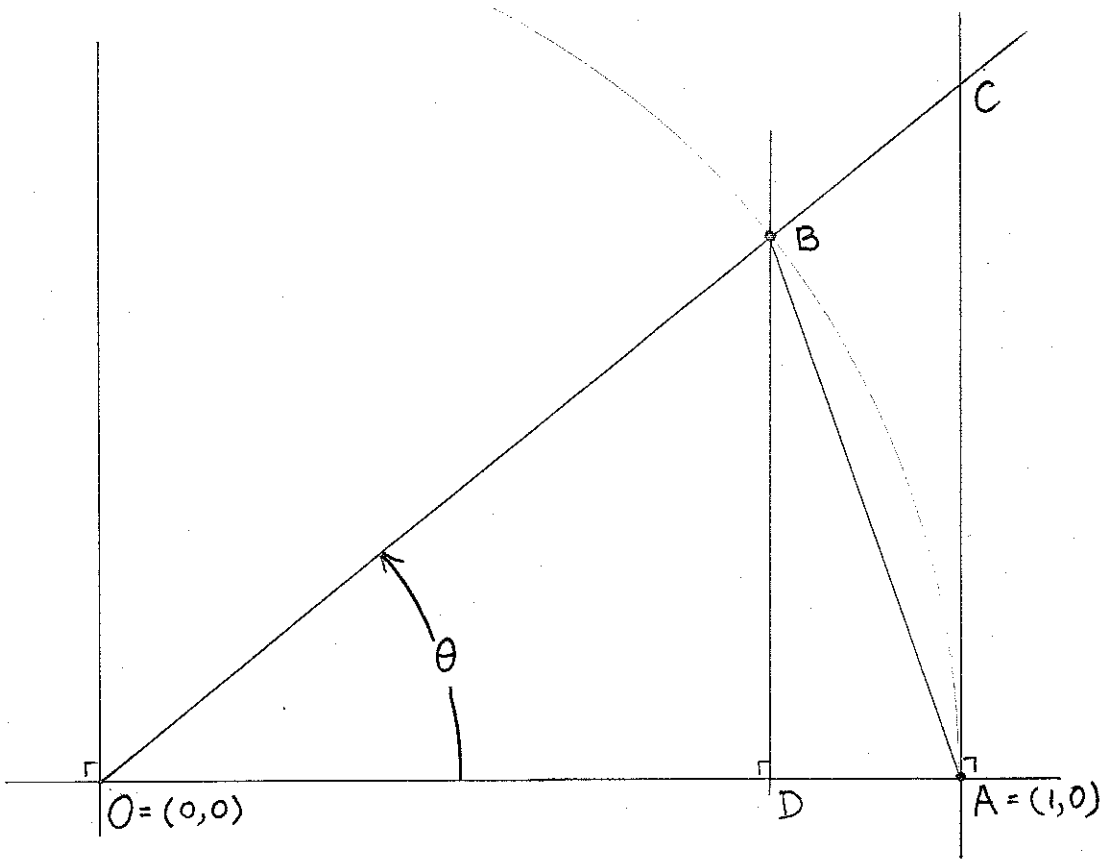

A. The picture above shows a portion of the unit circle in the x-y-plane, as well as a ray OB that makes a positive angle of θ radians with the positive x-axis.

1) What are the lengths of the following segments: OB, OD, BD, DA, AC?

2) What are the coordinates of the following points: B, C, D?

3) What is the area of triangle OAB?

4) What is the area of sector OAB? (Hint: This sector makes up a fraction of the circle equal to $\frac{\theta}{2\pi}$, while the area of the circle is π.)

5) By comparing the areas of triangle OAB and sector OAB, show that $0 < \sin\theta < \theta$ when θ is a small positive angle.

6) READ the Squeeze Theorem on page 99. What does 5) imply about $\lim_{\theta \to 0+} \sin\theta$? Is the sine function continuous from the right at 0?

7) Is it continuous at 0?

8) By comparing the length of segment DA with the length of segment DB, show that $1 - \theta < \cos\theta < 1$ for small positive θ.

9) What does this imply about $\lim_{\theta \to 0+} \cos\theta$?

10) Is the cosine function continuous at 0?

Morals: a) You got some experience with a representation of the sine and cosine in the unit circle. b) You saw that sine and cosine are both continuous at 0. c) You learned to use the Squeeze Theorem.