# Math 2250 Homework #4

This homework assignment covers the train linkage lab. The setup for the lab is that we have a linkage with an arm of length 3 connected to a point on a wheel of radius 1.
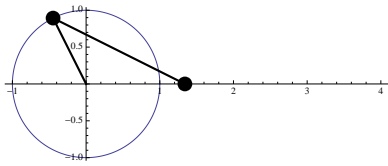
The position of the attachment point on the wheel is given by

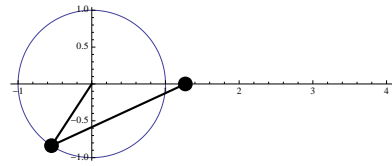$$x_{\text{attach}}(\theta) = \cos\theta. \qquad y_{\text{attach}}(\theta) = \sin\theta.$$

The position of the other end of the linkage lies on the x-axis at the point $(x, 0)$. This is shown in the pictures
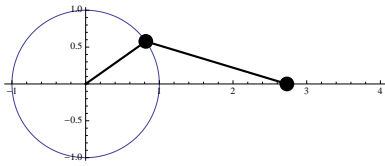
point slides along the x-axis ...   ... the wheel rotates ...   ... and point reverses direction.

1. PROBLEMS

1. Use implicit differentiation to find a formula for the derivative of x with respect to θ and a formula for the derivative of θ with respect to x.

2. At what x coordinate does moving the point on the axis (the piston) turn the wheel fastest? Explain your answer physically.

3. At what x coordinate does moving the point on the axis (the piston) turn the wheel slowest? Explain your answer physically.