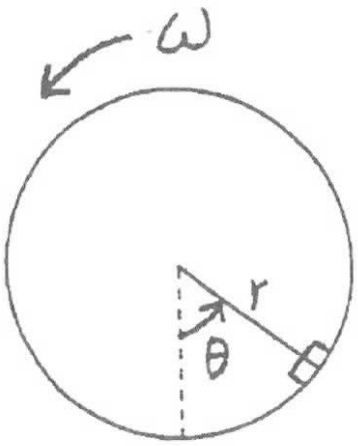
Sample 1a



The drum shown above rotates in the vertical direction with constant angular velocity $\omega = 5.8$ rad/s. A small block is initially at the lowest position ($\theta = 0$) and is held in place against the inner surface of the drum by static friction, where the coefficient of friction $\mu = .6$. The angles θ where the block starts and stops slipping are given by the equation:

$$\mu g \cos\theta + \mu r \omega^2 = g \sin\theta$$

where $r = 13$ in (this must be converted to feet) and $g = 32.2$ ft/s^2 .

Write a MATLAB program that uses Newton's Method to calculate the angles θ where the block starts and stops slipping. Use 50° and 150° as the initial guesses for θ and 1e-7 as the accuracy factor. Run the program separately for each initial guess. The output of these two runs should look like this:

```
Output of first run:   theta =  66.57597
Output of second run:  theta = 175.35154
```

Sample 1b

Repeat Sample 1a but this time, instead of implementing Newton's Method in the main program, call a function that uses Newton's Method to calculate θ. Name this function newton.

Sample 1c

Repeat Sample 1b but this time let the program generate the initial guesses for θ and calculate both values of theta in just one run of the program. The output of this one run should look like this:

```
theta =  66.57597
theta = 175.35154
```

Sample 1d

Repeat Sample 1c but this time call the MATLAB function fzero to calculate θ.