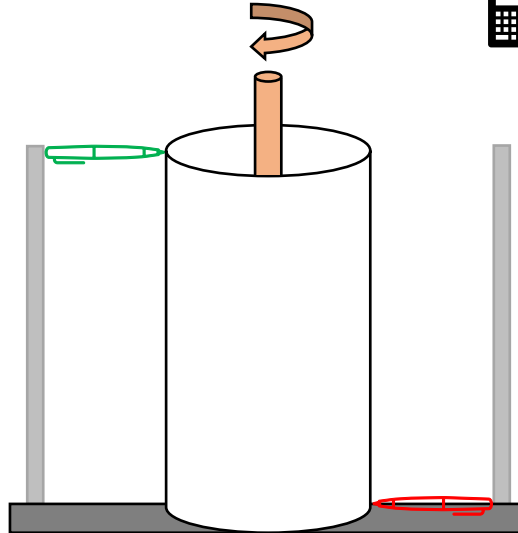# Spicy Question #50

An open topped cylinder of height 12 cm and radius $\frac{10}{\pi}$ cm is placed onto a machine.

Two pens of different colours are attached to poles at opposite sides of the cylinder.
The green pen just touches the top and the red pen the bottom.

When the machine is turned on:

- The cylinder turns at a constant speed, completing one turn every 3 seconds.
- The pens move vertically at a constant speed, whilst remaining in contact with the cylinder, leaving a coloured trail. The green pen moves down and the red pen moves up.

Once each pen reaches the other end of the cylinder the poles are moved so that the pen is no longer in contact with the cylinder.
The green pen lowers at a rate of 1 cm/second.

The red pen rises at a rate of $\frac{4}{3}$ cm/second.

The trails left by the pens intersect each other a total of 7 times.

The intersection closest to the top of the cylinder is point A.
The intersection closest to the bottom of the cylinder is point B.

Points A and B are connected directly with a straight line that goes through the cylinder (not along the surface).
Calculate the length of the line AB.
Give your answer to 4 decimal places.