49. (a) The distance traveled by the coin in 3.14 s is $3(2\pi r) = 6\pi(0.050) = 0.94$ m. Thus, its speed is $v = 0.94/3.14 = 0.30$ m/s.

(b) The acceleration vector (at any instant) is horizontal and points from the coin towards the center of the turntable. This centripetal acceleration is given by Eq. 6-17:

$$a = \frac{v^2}{r} = \frac{0.30^2}{0.050} = 1.8 \text{ m/s}^2 .$$

(c) The only horizontal force acting on the coin is static friction f_s and must be large enough to supply the acceleration of part (b) for the $m = 0.0020$ kg coin. Using Newton's second law,

$$f_s = ma = (0.0020)(1.8) = 3.6 \times 10^{-3} \text{ N}$$

which must point in the same direction as the acceleration (towards the center of the turntable).

(d) We note that the normal force exerted upward on the coin by the turntable must equal the coin's weight (since there is no vertical acceleration in the problem). We also note that if we repeat the computations in parts (a) and (b) for $r' = 0.10$ m, then we obtain $v' = 0.60$ m/s and $a' = 3.6$ m/s^2. Now, if friction is at its maximum at $r = r'$, then, by Eq. 6-1, we obtain

$$\mu_s = \frac{f_{s,\max}}{mg} = \frac{ma'}{mg} = 0.37 .$$