2.

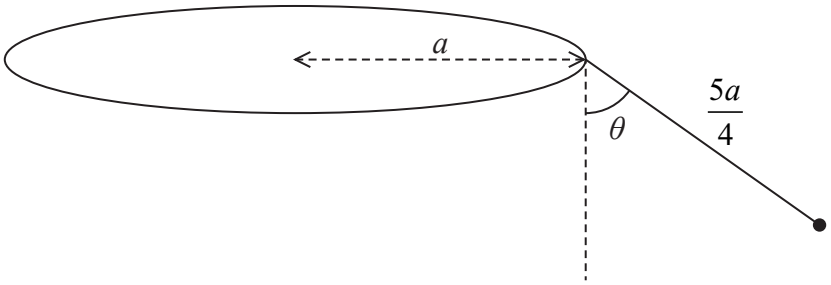


Figure 2

Figure 2 shows a fairground ride that consists of a chair of mass m attached to one end of a rigid arm of length $\frac{5a}{4}$. The other end of the arm is freely hinged to the rim of a thin horizontal circular disc of radius a. The disc rotates with constant angular speed ω about a vertical axis through the centre of the disc. As the ride rotates the arm remains in a vertical plane through the centre of the disc. The arm makes a constant angle θ with the vertical, where $\tan\theta = \frac{3}{4}$

The chair is modelled as a particle and the arm is modelled as a light rod.

(a) Find the tension in the arm in terms of m and g

(3)

(b) Find ω in terms of a and g

(6)

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Question 2 continued

(Total for Question 2 is 9 marks)