1 A particle P is moving in a fixed circle of radius 0.8 m. At time t s its velocity is $(t^2 - t + 2)\,\mathrm{m\,s^{-1}}$. Find the magnitudes of the radial and the transverse components of the acceleration of P when $t = 2$. [3]

Radial component .....

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Transverse component .....

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2 Two uniform small spheres A and B have equal radii and masses $4m$ and m respectively. Sphere A is moving with speed u on a smooth horizontal surface when it collides directly with sphere B which is at rest. The coefficient of restitution between the spheres is e.

(i) Show that after the collision A moves with speed $\frac{1}{5}u(4 - e)$ and find the speed of B. [4]

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Sphere B continues to move until it collides with a fixed smooth vertical barrier which is perpendicular to the direction of motion of B. The coefficient of restitution between B and the barrier is $\frac{3}{4}e$. After this collision, the speeds of A and B are equal.

(ii) Find the value of e. [3]

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The spheres A and B now collide directly again.

(iii) Determine whether sphere B collides with the barrier for a second time. [2]

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[Turn over