11 A man P runs in a straight line from O to A, leaving O at time $t = 0$. At time t seconds his velocity $v\,\text{m s}^{-1}$ is given by $v = 5 + 0.003t^2$.

Another man Q runs from O to A at a constant speed of $7.08\,\text{m s}^{-1}$, starting 5 seconds after P.

(a) Show that the times T s when P and Q are the same distance from O satisfy the equation

$$T^3 - 2080T + 35400 = 0.$$ **[5]**

(b) In this question you must show detailed reasoning.

As they run from O to A there are two times at which P and Q are the same distance from O. The second of these is when $T = 30$.

Find the acceleration of P at the first of these times. **[5]**