**Question 20** **(9 marks)**

A model train travels on a straight track such that its acceleration after $t$ seconds is given by $a(t) = pt - 13$ cm/s$^2$, $0 \leq t \leq 10$, where $p$ is a constant.

(a) Determine the initial acceleration of the model train. (1 mark)

The model train has an initial velocity of 5 cm/s. After 2 seconds it has a displacement of –50 cm. A further 4 seconds later its displacement is 178 cm.

(b) Determine the value of the constant $p$. (4 marks)

(c) When is the model train at rest? (2 marks)

(d) How far has the model train travelled when its acceleration is 47 $cm/s^2$? (2 marks)