10 A particle P moves in a straight line.
t seconds after passing a fixed point, O, the acceleration of P, $a\,\text{ms}^{-2}$, is given by

$$a = t^2 - 2 \qquad \text{for } 0 \leqslant t \leqslant 4$$
$$a = 19 - 5\text{e}^{8-2t} \qquad \text{for } 4 \leqslant t \leqslant 10.$$

When $t = 3$, the velocity of P is $-\frac{1}{3}\text{ms}^{-1}$ and its displacement from O is $-\frac{1}{4}\text{m}$.

(a) (i) Find the velocity of P when $t = 4$. [3]

(ii) Find the displacement of P from O when $t = 4$. [3]

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(b) Find the displacement of P from O when $t = 10$. [5]

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Question 11 is printed on the next page.

11 A geometric progression has first term a and common ratio r, where $r > 0$.
The sum of the 2nd and 3rd terms of the progression is 168.
The sum of the 4th and 5th terms of the progression is 94.5.

(a) Find the 6th term of the progression. [7]

(b) Find the sum to infinity of the progression. [1]

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