8 **Answer the whole of this question on a sheet of graph paper.**

A particle moves in a straight line so that at time t seconds, its distance y metres from a fixed point, O, is given by $y = t + \frac{32}{t+2} - 8$.
The following table gives some corresponding values of t and y.

t (seconds)	0	1	2	3	4	5	6	8	10	12	14
y (metres)	8	3.67	2	1.4	1.33	1.57	2	3.2	4.67	k	8

(a) Calculate the value of k. [1]

(b) Using a scale of 1 cm to represent 1 second, draw a horizontal t–axis for $0 \le t \le 14$.
Using a scale of 2 cm to represent 1 metre, draw a vertical y–axis for $0 \le y \le 8$.
On your axes, plot the points given in the table and join them with a smooth curve. [3]

(c) Explain the significance of the y–intercept. [1]

(d) Find the time when the particle is nearest to the fixed point, O. [1]

(e) Mark and label P, the point on your graph when the particle is 4 metres from the fixed point, O and moving away from O. [1]

(f) Find the length of time for which the particle is less than or equal to 2.5 metres from the fixed point, O. [1]

(g) By drawing a tangent, find the gradient of the curve at $t = 6$. [2]

(h) The equation $t + \frac{32}{t+2} = 13 - \frac{1}{4}t$ can be solved by drawing a straight line on the same axes.

(i) Draw this line for $0 \le t \le 14$. [1]

(ii) Write down the t–coordinates of the points where the line intersects the curve. [2]