2 In this question, all lengths are in metres and time is in seconds.

A particle P moves in a straight line such that its displacement s from a fixed point O at time t is given by $s = (t-4)^2(t-1)$ for $t \geqslant 0$.

(a) On the axes, sketch the displacement–time graph of P, stating the intercepts with the axes. [2]



(b) Find an expression for the velocity, v, of P.
Give your answer in a factorised form. [2]

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(c) On the axes, sketch the velocity–time graph of P, stating the intercepts with the axes. [2]



(d) Find an expression for the acceleration, a, of P. [1]

(e) On the axes, sketch the acceleration–time graph of P, stating the intercepts with the axes. [3]



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3 Functions f and g are such that

$$\mathrm{f}(x) = \frac{3x}{x+4} \quad \text{for } x > 0$$

$$\mathrm{g}(x) = \sqrt{x+2} \quad \text{for } x > -2\,.$$

Solve the equation $\mathrm{fg}(x) = 1$. [4]

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