1. At time t seconds, $t > 0$, a particle P is at the point with position vector $\mathbf{r}$ m, where

$$\mathbf{r} = \left(t^4 - 8t^2\right)\mathbf{i} + \left(6t^2 - 2t^{\frac{3}{2}}\right)\mathbf{j}$$

(a) Find the velocity of P when P is moving in a direction parallel to the vector $\mathbf{j}$

(4)

(b) Find the acceleration of P when $t = 4$

(3)

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Question 1 continued

(Total for Question 1 is 7 marks)