9 A particle moves in the x-y plane so that at time t seconds, where $t \geqslant 0$, its coordinates are given by

$x = e^{2t} - 4e^t + 3$, $y = 2e^{-3t}$.

(a) Explain why the path of the particle never crosses the x-axis. [1]

(b) Determine the exact values of t when the path of the particle intersects the y-axis. [2]

(c) Show that $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{3}{2e^{4t} - e^{5t}}$. [4]

(d) Hence find the coordinates of the particle when its path is parallel to the y-axis. [3]