10 A curve has equation $y = \dfrac{3\ln x + 1}{4x - 1}$.

(a) Find an expression for $\dfrac{dy}{dx}$. **[3]**

The curve $y = \dfrac{3\ln x + 1}{4x - 1}$ has a stationary point at P.

(b) Show that the x-coordinate of P satisfies the equation $x = \dfrac{8x - 3}{12\ln x}$. **[3]**

(c) Show by calculation that the equation in part **(b)** has a root between 1.6 and 1.7. **[3]**

(d) (i) Use the iterative formula

$$x_{n+1} = \frac{8x_n - 3}{12\ln x_n}$$

with a starting value of $x_1 = 1.65$ to find the value of the x-coordinate of P correct to **3** significant figures. You must show the result of each iteration. **[3]**

(ii) Hence give the coordinates of P correct to **3** significant figures. **[1]**

(e) A student draws a diagram to show how the iterative process used in part **(d)(i)** converges to the root found.

State the type of convergence shown in the student's diagram. Give a reason for your answer. **[2]**