C1/H
Tangents and Normals

① The curve C has equation

$$y = x^4 + x + 1.$$

Find the equation of the tangent to C at the point $(1, 3)$. [4]

② The straight line $y = 2x + c$ is a tangent to the curve $y = x^2 + 6x + 7$.

(a) Determine the value of the constant c. [4]

(b) Find the coordinates of the point of contact of the tangent and the curve. [2]

③ The curve C has equation $y = 3x^{\frac{3}{2}} - \dfrac{32}{x}$.

(a) Find the equation of the tangent to C at the point where $x = 4$. [7]

(b) Find the equation of the normal to C at the point where $x = 4$. [2]

④ Find the equation of the normal to the curve $y = 4x^2 - 7x + 2$ at the point $(2, 4)$. [4]

⑤ The curve C has equation

$$y = 16\sqrt{x} + \frac{32}{x} + 2 .$$

(a) Find the value of $\dfrac{dy}{dx}$ when $x = 4$. [3]

(b) Find the equation of the normal to C at the point where $x = 4$. [3]