The remainder of this page has been left blank for your workings.
Very short answer questions

1. [2 marks] Each part is worth 1 marks. Please write your answers in the boxes.

(a) Find \( \frac{dy}{dx} \), if \( y = \frac{3 + 2x}{2 + 7x} \).

Answer:

(b) The following limit is equal to the derivative of a function at a point:

\[
\lim_{x \to 1} \frac{3^x - 3}{x - 1}
\]

Evaluate the limit. You can (and should) use differentiation rules, but not l’Hopital’s rule.

Answer:
Short answer questions — you must show your work

2. [4 marks] Each part is worth 2 marks.
   (a) Let \( h(x) = \sqrt{x}(\cot(x) + \sin(x)) \). Find \( h'(x) \).
      Answer:

   (b) The position of a particle at time \( t \) is given by \( s(t) = \frac{1}{3} t^3 - \frac{5}{2} t^2 + 6t \). Find all values of \( t \) where the particle has zero velocity.
      Answer:
Long answer question — you must show your work

3. [4 marks] Let $f(x)$ be a function such that $f(e) = -2$ and $f'(e) = 4$. Let $g(x) = x \cdot f(e^x)$. Find the equation of the line tangent to $y = g(x)$ at $x = 1$. 