Calculus Exercises (2.1; 2.2)

1. Find the derivative of the function \( f(x) = \sqrt{1 + 2x} \) using the definition of a derivative. State the domain of its derivative.

2. Some values of a function \( T(t) \) are given below. Use them to estimate (估計) the value of \( T'(10) \).

<table>
<thead>
<tr>
<th>( t )</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>( T )</td>
<td>73</td>
<td>73</td>
<td>70</td>
<td>69</td>
<td>72</td>
<td>81</td>
<td>88</td>
<td>91</td>
</tr>
</tbody>
</table>

3. If \( f'(a) = 4 \), find \( \lim_{h \to 0} \frac{f(a + 3h) - f(a - 2h)}{h} \).

4. \( f(x) = \begin{cases} x^2 + x - 1, & \text{if } x \geq 1 \\ 2 - x^2, & \text{if } x < 1 \end{cases} \). Is \( f \) differentiable at \( x = 1 \)? State the reason.

5. Let \( f(x) = 2x - x^3 \), find the third derivative of \( f \).

6. (1) The graph of \( f \) is given in Graph 1, use it to sketch the graph of \( f' \) below it.
   (2) State, with reasons, the values of \( x \) at which the function given in Graph 2 is not differentiable.

   [Graph 1]:

   ![Graph 1](image1)

   [Graph 2]:

   ![Graph 2](image2)