Chapter 2 Practice Questions

1. What is the average rate of change for the function \( f(x) = -x^2 + x - 5 \) over the interval \( 1 \leq x \leq 4 \)?

2. A stone falls from the edge of a cliff into the sea below. The height of the stone after \( t \) seconds is described by the function \( h(t) = -4.9t^2 + 150 \), where \( h(t) \) is measured in metres. What is the average rate of change in the height of the stone from \( t = 4 \) s to \( t = 5 \) s?

3. Determine the value of \( a \) so that the average rate of change of the function \( j(x) = 3x^2 + ax - 4 \) over the interval \( -1 \leq x \leq 2 \) is 8.

4. The slope of which type of line represents the average rate of change of a function over an interval?

5. The value of a family’s home is given by \( f(x) = 130000 (1.06)^x \), where \( x \) is the number of years after the family purchases the house for $130 000. What is the best estimate for the instantaneous rate of change in the value of the home when the family has owned it for 5 years?

6. For the function \( g(x) = x^2 - 2x + 5 \), what is the best estimate for the instantaneous rate of change at \( x = 3 \)?

7. Martin walks 5 m toward a motion sensor over the course of 10 s, at a constant speed. What would be the slope of the segment representing this walk on a distance versus time graph?
8. During which interval of time is the speed the greatest?

9. What is the speed at which an object is travelling between \( t = 6 \) s and \( t = 10 \) s if the graph below is the distance versus time graph for the object?

10. A student is walking in a straight line in front of a motion sensor. What does he need to do to produce a horizontal segment on the distance versus time graph?

11. For what value of \( x \) does the maximum or minimum of \( f(x) = x^2 + 8x + 12 \) occur? Use the IRC to prove the point is a turning point. Is the point a maximum or a minimum?

12. The monthly revenue for printer ink for a large office supply store is \( R(x) = -x^2 + 12x + 13 \), where \( x \) is the price of an ink cartridge in dollars and \( R(x) \) is in hundreds of dollars. What is the maximum monthly ink revenue?
13. What are some methods that can be used to estimate the instantaneous rate of change in \( g(x) \) at \( x = a \)?

14. When using intervals to estimate the instantaneous rate of change, how can the best estimate be obtained?

15. What does the slope of a secant line through two points on the graph of a distance versus time graph represent?

16. Determine two functions \( f(x) \) and \( g(x) \) that have the same average rate of change over the interval \( 0 \leq x \leq 2 \).

17. Use the difference quotient to estimate the instantaneous rate of change in \( f(x) = x^2 \) at \( x = 3 \).

18. The sales of a new children’s book at a local book store are shown in the table below. The time represents the number of weeks after the book first went on sale. Estimate the instantaneous rate of change in the number of books sold at 7 weeks.

<table>
<thead>
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<th>Week</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books Sold</td>
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<td>9</td>
<td>14</td>
<td>20</td>
<td>32</td>
<td>19</td>
<td>16</td>
<td>10</td>
<td>6</td>
<td>2</td>
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