1. Estimate the slope of the tangent line of \( f(x) = x^2 - 9 \) at \( x = -4 \) and then use it to find the equation of the tangent line at \( x = -4 \).

2. Use the table below to find the average rate of change over the following intervals:
   a. \([1, 3]\), \([2, 3]\), \([3, 4]\), \([3, 5]\)
   b. Approximate the instantaneous rate of change at \( x = 3 \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>5</td>
<td>25</td>
<td>55</td>
<td>95</td>
<td>145</td>
<td>205</td>
</tr>
</tbody>
</table>

3. Given the graph below, find the following limits:

4. Sketch the graph of a function that satisfies the following conditions:
   a. \( \lim_{x \to 0^-} f(x) = -1, \quad \lim_{x \to 0^+} f(x) = 2, \quad f(0) = 1 \)

5. Sketch the graph of a function that satisfies the following conditions:
   a. \( \lim_{x \to -4^-} f(x) = 3, \quad \lim_{x \to -4^+} f(x) = 0, \quad \lim_{x \to 0} f(x) = 2 \)
   b. \( f(-4) = 3, \quad f(0) = -2 \)

6. Sketch the graph and use it to determine the value(s) of \( a \) for which \( \lim_{x \to a} f(x) \) exists.

   \[
   f(x) = \begin{cases} 
   5 + x, & x < 2 \\
   x^2 + 2, & -2 \leq x < 1 \\
   -x + 4, & x \geq 1 
   \end{cases}
   \]
Evaluate the following limits algebraically (if they exist):

7. \( \lim_{x \to 3} f(x) = \frac{x^2+5x+6}{4x^2+13x+3} \)

8. \( \lim_{x \to -3} f(x) = \frac{x^2+5x+6}{4x^2+13x+3} \)

9. \( \lim_{h \to 0} f(x) = \frac{(9+h)^2 - 81}{h} \)

10. \( \lim_{x \to 2} f(x) = \frac{x^3+x^2-6x}{x-2} \)

11. \( \lim_{x \to -9} f(x) = \frac{x^2-81}{x^2+7x-18} \)

12. \( \lim_{x \to -3} f(x) = \frac{\sqrt{x^2+16} - 5}{x+3} \)

13. \( \lim_{x \to 3} f(x) = \frac{x^2+3x}{x-3} \)

14. \( \lim_{x \to -4} f(x) = \frac{\frac{1}{x} + \frac{1}{4}}{4+x} \)

15. \( \lim_{x \to 0} f(x) = \left( \frac{1}{x} - \frac{1}{x^2+x} \right) \)

16. If \( f(x) = \begin{cases} 3 - x^2, & x \leq 2 \\ 4x - 5, & x > 2 \end{cases} \), find \( \lim_{x \to 2} f(x) \)

Note: With many thanks to Kendra Kilmer