Topic: Difference Quotient: \( \frac{f(x + h) - f(x)}{h} \); (This is the format assumed, like text.)

Note to teacher: These are hand calculations. A student will need to type in an answer. Order is not important. It is best not to use spaces.

1. Use the Difference Quotient to evaluate \( f(x) = 2x^2 - 3x + 5 \). Simplify completely.
   Answer: \( 4x + 2h - 3 \)

2. Use the Difference Quotient to evaluate \( f(x) = 2x^2 - 4x + 3 \). Simplify completely.
   Answer: \( 4x + 2h - 4 \)

3. Use the Difference Quotient to evaluate \( f(x) = 2x^2 - 6x + 1 \). Simplify completely.
   Answer: \( 4x + 2h - 6 \)

4. Use the Difference Quotient to evaluate \( f(x) = 2x^2 - x + 7 \). Simplify completely.
   Answer: \( 4x + 2h - 1 \)

5. Use the Difference Quotient to evaluate \( f(x) = 2x^2 - 5x - 6 \). Simplify completely.
   Answer: \( 4x + 2h - 5 \)
Topic: Find domain of a rational function.

Note to teacher: These are hand calculations. A student will need to type in an answer. Order is important (follow the number line left to right) and the program expects interval notation. Use the following nomenclature: $-\infty = -\infty$, $\infty = \infty$. Use a capital U for union. ( ) for open. [ ] for closed. It is best not to use spaces.

1. Find the Domain for $f(x)$, in interval notation. $f(x) = \frac{\sqrt{x-1}}{x^2-x-6}$ (Use "U" for Union, "inf" for infinity, and "-inf" for negative infinity, if applicable.)

Answer: $[1, 3) \cup (3, \infty)$

2. Find the Domain for $f(x)$, in interval notation. $f(x) = \frac{\sqrt{x-3}}{x^2-3x-4}$ (Use "U" for Union, "inf" for infinity, and "-inf" for negative infinity, if applicable.)

Answer: $[3, 4) \cup (4, \infty)$

3. Find the Domain for $f(x)$, in interval notation. $f(x) = \frac{\sqrt{x-4}}{x^2-4x-5}$ (Use "U" for Union, "inf" for infinity, and "-inf" for negative infinity, if applicable.)

Answer: $[4, 5) \cup (5, \infty)$

4. Find the Domain for $f(x)$, in interval notation. $f(x) = \frac{\sqrt{x-5}}{x^2-5x-6}$ (Use "U" for Union, "inf" for infinity, and "-inf" for negative infinity, if applicable.)

Answer: $[5, 6) \cup (6, \infty)$

5. Find the Domain for $f(x)$, in interval notation. $f(x) = \frac{\sqrt{x-2}}{x^2-x-6}$ (Use "U" for Union, "inf" for infinity, and "-inf" for negative infinity, if applicable.)

Answer: $[2, 3) \cup (3, \infty)$
Topic: Limit Criterion (concept).

Note to teacher: This is a multi-answer multiple choice question. The student should select all answers that are correct using radio buttons. Incorrect selections will count against the total scoring of the question, but you cannot score less than 0.

1. Which MUST be true for \( \lim_{x \to a} f(x) \) to exist? (Select ALL that are true.)

   a. \( \lim_{x \to a} f(x) \) exists
   
   b. \( \lim_{x \to a} f(x) \) exists
   
   c. \( \lim_{x \to a} f(x) = \lim_{x \to a} f(x) \)
   
   d. \( f(a) \) exists
   
   e. \( \lim_{x \to a} f(x) = \lim_{x \to a} f(x) = f(a) \)
   
   f. \( \lim_{x \to a} f(x) = f(a) \) OR \( \lim_{x \to a} f(x) = f(a) \)

Answers: a, b, c must be true.
**Topic:** Managing composite function values from a chart.

**Note to teacher:** This is a fill in the blank style question. A student will need to type in an answer after evaluating the contents of a table. In this case, the answer will be an integer.

<table>
<thead>
<tr>
<th>$x$</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>7</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>-4</td>
<td>-2</td>
<td>-1</td>
</tr>
</tbody>
</table>

1. $g(x)$ | 1 | 4 | 7 | 6 | 0 | 9 | -2 |

For the given chart, $(g \circ f)(-2) =$ _____.

Answer: 9

<table>
<thead>
<tr>
<th>$x$</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
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<td>1</td>
<td>-4</td>
<td>-2</td>
<td>-1</td>
</tr>
</tbody>
</table>

2. $g(x)$ | 1 | 4 | 7 | 6 | 0 | 9 | -2 |

For the given chart, $(f \circ g)(1) =$ _____.

Answer: 1

<table>
<thead>
<tr>
<th>$x$</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2</td>
<td>5</td>
<td>1</td>
<td>-4</td>
<td>-2</td>
<td>-1</td>
</tr>
</tbody>
</table>

3. $g(x)$ | 1 | 4 | 7 | 6 | 0 | 9 | -2 |

For the given chart, $(g \circ f)(3) =$ _____.

Answer: 7

<table>
<thead>
<tr>
<th>$x$</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>7</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>-4</td>
<td>-2</td>
<td>-1</td>
</tr>
</tbody>
</table>

4. $g(x)$ | 1 | 4 | 7 | 6 | 0 | 9 | -2 |

For the given chart, $(f \circ f)(-2) =$ _____.

Answer: -2

<table>
<thead>
<tr>
<th>$x$</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
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<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>7</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>-4</td>
<td>-2</td>
<td>-1</td>
</tr>
</tbody>
</table>

5. $g(x)$ | 1 | 4 | 7 | 6 | 0 | 9 | -2 |

For the given chart, $(g \circ g)(1) =$ _____.

Answer: 6
**Topic:** Finding a limit from a graph.

**Note to teacher:** This is a fill in the blank style question. After inspecting the nature of a graph, a student will need to type in an integer answer or DNE (does not exist).

1. For the given graph, \( \lim_{x \to a} f(x) = \) _____ and \( \lim_{x \to b} f(x) = \) ____. (Use "DNE" for "Does Not Exist," if applicable.)

   Answer1: 2  Answer2: DNE

2. For the given graph, \( \lim_{x \to a} f(x) = \) _____ and \( \lim_{x \to b} f(x) = \) ____. (Use "DNE" for "Does Not Exist," if applicable.)

   Answer1: 4  Answer2: DNE
For the given graph, \( \lim_{{x \to a}} f(x) = \) \( DNE \) and \( \lim_{{x \to b}} f(x) = \) \( 0 \). (Use "DNE" for "Does Not Exist," if applicable.)

Answer 1: 0
Answer 2: DNE

For the given graph, \( \lim_{{x \to a}} f(x) = \) \( 4 \) and \( \lim_{{x \to b}} f(x) = \) \( DNE \). (Use "DNE" for "Does Not Exist," if applicable.)

Answer 1: 4
Answer 2: DNE
5. For the given graph, \( \lim_{x \to a} f(x) = \) _____ and \( \lim_{x \to b} f(x) = \) ____. (Use "DNE" for "Does Not Exist," if applicable.)

Answer 1: -4  
Answer 2: DNE