9. [10 points] Suppose \( g(x) \) is a function and \( G(x) \) is an antiderivative of \( g(x) \) such that \( G(x) \) is defined and continuous on the entire interval \(-4 \leq x \leq 6\). Portions of the graphs of \( g \) and \( G \) are shown below. Note the following:

- \( g(x) \) is zero for \(-1 \leq x \leq 0\).
- For \( 4 \leq x \leq 6 \), the graph of \( g(x) \) is the lower half of the circle of radius 1 centered at \((5, 0)\).
- For \( 0 \leq x \leq 1 \), the graph of \( G(x) \) is the top right quarter of the circle of radius 1 centered at the origin.

a. [4 points] Use the portions of both graphs shown on the right to complete the table below with the exact values of \( G(x) \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>(-3)</th>
<th>(-1)</th>
<th>(4)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( G(x) )</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>(4 - \frac{\pi}{2})</td>
</tr>
</tbody>
</table>

Solution: Note from the graph of \( G \) that \( G(0) = 1 \), \( G(1) = 0 \), and \( G(2) = 2 \). We find the values in the table by using the Fundamental Theorem of Calculus (and finding appropriate areas using the graph of \( g(x)\)).

\[
G(4) = \int_{2}^{4} g(x) \, dx + G(2) = 2 + 2 = 4.
\]

\[
G(6) = \int_{4}^{6} g(x) \, dx + G(4) = -\frac{\pi}{2} + 4.
\]

\[
G(-1) = G(0) - \int_{-1}^{0} f(x) \, dx = 1 - 0 = 1.
\]

\[
G(-3) = G(-1) - \int_{-3}^{-1} f(x) \, dx = 1 - (-2) = 1.
\]

b. [6 points] Use the axes on the right to sketch the missing portions of the graphs of \( g \) and \( G \) over the interval \(-4 \leq x \leq 6\).

Be sure that you pay close attention to each of the following:

- the values of \( G(x) \) you found in part (a) above
- where \( G \) is/is not differentiable
- where \( G \) and \( g \) are increasing, decreasing, or constant
- the concavity of the graph of \( y = G(x) \)