1. Here is a table of values for a function \( g(x, t) \). Given that \( g \) is a linear function, fill in all the missing values.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>100</td>
<td>2</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>200</td>
<td>0</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>300</td>
<td>-2</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

2. If \( f(x, y) = xe^{-(x^2+y^2)} \), find \( \frac{\partial f}{\partial x} \) and \( \frac{\partial f}{\partial y} \).

Solution: We have
\[
\frac{\partial f}{\partial x} = x(-2xe^{-(x^2+y^2)}) + e^{-(x^2+y^2)} = (1 - 2x^2)e^{-(x^2+y^2)} \quad \text{and} \quad \frac{\partial f}{\partial y} = -2xye^{-(x^2+y^2)}.
\]

3. Find the local linearization of the function \( h(x, y) = \frac{x^3}{y} \) at the point \((1, 2)\).

Solution: We have \( \frac{\partial h}{\partial x} = \frac{3x^2}{y} \) and \( \frac{\partial h}{\partial y} = -\frac{x^3}{y^2} \), so that
\[
\left. \frac{\partial f}{\partial x} \right|_{(1,2)} = \frac{3}{2} \quad \text{and} \quad \left. \frac{\partial f}{\partial y} \right|_{(1,2)} = -\frac{1}{4}.
\]

We also note that \( h(1, 2) = \frac{1}{2} \). The local linearization is
\[
\frac{1}{2} + \frac{3}{2}(x - 1) - \frac{1}{4}(y - 2).
\]