1. Find the first partial derivatives of the function \( f(x, y) = \frac{x}{y} \), then find a point \( P(a, b) \) such that \( \frac{\partial f}{\partial x}(a, b) = \frac{\partial f}{\partial y}(a, b) = \frac{1}{2} \).

**Solution:** Treat \( y \) as constant, get \( \frac{\partial f}{\partial x} = \frac{1}{y} \).

Treat \( x \) as constant, get \( \frac{\partial f}{\partial y} = -\frac{x}{y^2} \).

\[ \frac{1}{2} = \frac{\partial f}{\partial x} = \frac{1}{y} \Rightarrow y = 2. \]

\[ \left\{ y = 2 \text{ and } \frac{1}{2} = \frac{\partial f}{\partial y} = -\frac{x}{y^2} \right\} \Rightarrow x = -2. \]

So the point is \((-2, 2)\).

2. Find the first partial derivatives of the function \( w = \ln(x + 2y + 3z) \).

**Solution:** Treat \( y \) and \( z \) as constant, get \( \frac{\partial w}{\partial x} = \frac{1}{x + 2y + 3z} \).

Treat \( x \) and \( z \) as constant, get \( \frac{\partial w}{\partial y} = \frac{2}{x + 2y + 3z} \).

Treat \( x \) and \( y \) as constant, get \( \frac{\partial w}{\partial z} = \frac{3}{x + 2y + 3z} \).

3. Find the gradient of the function \( f(x, y, z) = \frac{xz}{x^2 + y^2} \), and evaluate the gradient at the point \( Q = (1, 1, 0) \).

**Solution:**

\[ \frac{\partial f}{\partial x} = \frac{z(x^2 + y^2) - xz(2x)}{(x^2 + y^2)^2} = \frac{z(y^2 - x^2)}{(x^2 + y^2)^2} \]

\[ \frac{\partial f}{\partial y} = \frac{-xz(2y)}{(x^2 + y^2)^2} = \frac{-2xyz}{(x^2 + y^2)^2} \]

\[ \frac{\partial f}{\partial z} = \frac{x}{x^2 + y^2} \]

So

\[ \nabla f = \left\langle \frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial f}{\partial z} \right\rangle = \left\langle \frac{z(y^2 - x^2)}{(x^2 + y^2)^2}, \frac{-2xyz}{(x^2 + y^2)^2}, \frac{x}{x^2 + y^2} \right\rangle \]

Evaluating at \( Q = (1, 1, 0) \), we get

\[ \nabla f(1, 1, 0) = \langle 0, 0, \frac{1}{2} \rangle \]