Problem:

Find the gradient of the function at the given point:

$z = x^2 + y^2, \qquad M(3;2).$

Solution:

The gradient of function z at point M is:

$$grad\ z\Big|_M = (z'_x)\Big|_M \cdot \vec{\imath} + (z'_y)\Big|_M \cdot \vec{\jmath},$$

Let's find the partial derivatives of z at point M:

$$z'_x = 2x, \qquad z'_y = 2y, \qquad \Rightarrow (z'_x)\Big|_M = 6, \qquad (z'_y)\Big|_M = 4, \qquad \Rightarrow\ grad\ z\Big|_M = 6\vec{\imath} + 4\vec{\jmath}.$$

Answer: $6\vec{\imath} + 4\vec{\jmath}$.