1. Find the directional derivative of $f(x, y)=e^{x} \sin y$ at $\left(0, \frac{\pi}{3}\right)$ in the direction of $\mathbf{v}=\langle-6,8\rangle$.
2. Suppose that the temperature at a point $(x, y, z)$ in space is given by $T(x, y, z)=80 /\left(1+x^{2}+2 y^{2}+3 z^{2}\right)$ where $T$ is measured in degrees Celsius and $x, y, z$ in meters. In which direction does the temperature increase fastest at the point $(1,1,-2)$ ? What is the maximum rate of increase?
3. Find all points in which the direction of fastest change of the function $f(x, y)=x^{2}+y^{2}-2 x-4 y$ is $\mathbf{i}+\mathbf{j}$.
