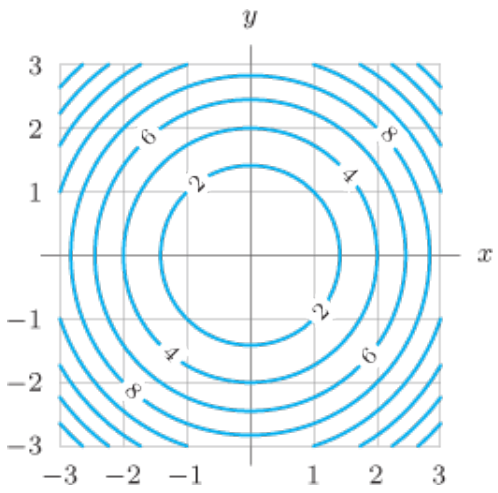
14.4 Gradients and Directional Derivatives in the Plane

Name: Date:

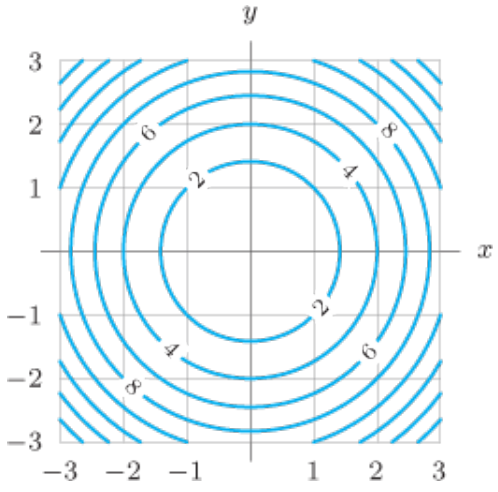
P 7. Find the gradient of $z = (x + y)e^y$.

P 21. Find the gradient of $f(x, y) = 1/(x^2 + y^2)$ at $(-1, 3)$.

P 33. Use the contour diagram of f below to decide if the the directional derivative at the point $(-2, 2)$, in the direction $\vec{i}$, is positive, negative, or approximately zero.



P 34. Use the contour diagram of f below to decide if the the directional derivative at the point $(0, -2)$, in the direction $\vec{i} + 2\vec{j}$, is positive, negative, or approximately zero.



P 46. Let $f(P) = 15$ and $f(Q) = 20$ where $P = (3, 4)$ and $Q = (3.03, 3.96)$. Approximate the directional derivative of f at P in the direction of Q.

P 65. A sketch of the surface $z = g(x, y)$ is given below. What is the sign of each of the following directional derivatives?

(a) $g_{\vec{u}}(2, 5)$ where $\vec{u} = (\vec{i} - \vec{j})/\sqrt{2}$.

(b) $g_{\vec{u}}(2, 5)$ where $\vec{u} = (\vec{i} + \vec{j})/\sqrt{2}$.