Math 1LT3 — Assignment 15

Extra practice with second-order derivatives (Section 7)

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1. Write the limit definition of $f_{xy}(a, b)$ as $(f_x)_y$.

2. Sketch a contour diagram of a function for which $f_x > 0$ and $f_{xx} < 0$ at all points in the plane.

3. Find the indicated partial derivatives for $f(x, y) = \dfrac{xy}{x^2 + 1}$; f_{xx}, f_{yx}, f_{yy}

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4. Using the values of the function given in Table 7.5 on page V1-85, estimate each partial derivative.

(a) $f_x(4,1)$ and $f_{xx}(4,1)$

(b) $f_y(4,1)$ and $f_{yy}(4,1)$

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5. Find the degree-2 Taylor polynomial of the given function at the given point.

(a) $f(x, y) = e^{-x^2-y^2}$; $(0, 0)$

(b) $f(x, y) = 1 - x^3 - y^2$; $(1, 1)$

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6. Compute the linear and the quadratic approximations of $f(x, y) = (xy)^{-1}$ at $(1, 1)$. Compare the values of the two approximations at $(1.1, 0.9)$ with the value $f(1.1, 0.9)$.

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7. Use the degree-2 Taylor polynomial to approximate $3.99 \arctan 0.1$.

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