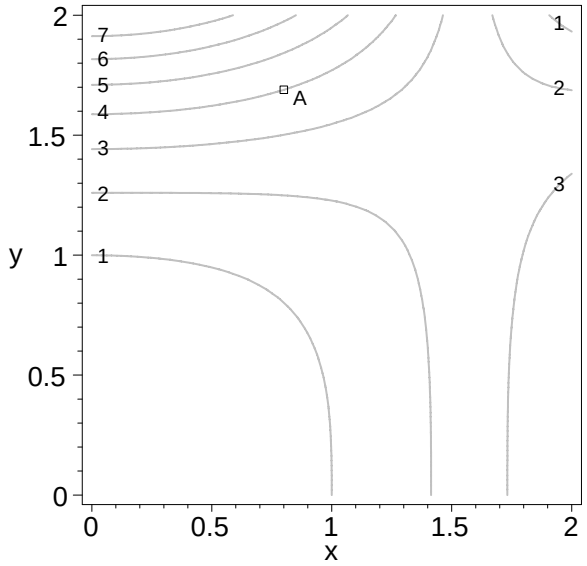
QUIZ #3, Math 253

1. Given the contour plot of $f(x, y)$,



   (a) plot the direction of ∇f at point A on the diagram;

   (b) state whether the following quantities are positive or negative at point A:

      i. $\frac{\partial f}{\partial x}$,

      ii. $\frac{\partial f}{\partial y}$,

      iii. derivative of f in the direction of the vector $\langle -1, -2 \rangle$,

      iv. $\frac{dy}{dx}$ along the level curve $f(x, y) = 4$.

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2. Find the equations of the tangent plane and normal line to the surface $z = \ln(xy - y^4)$ at the point $(x, y, z) = (2, 1, 0)$.

3. Suppose $\nabla f = \langle 1, -2 \rangle$ at point P.

   (a) Find the derivative of f at point P in the direction of the vector $\langle 3, 4 \rangle$.

   (b) Find a unit vector $\vec{v}$ so that the derivative of f at point P in the direction $\vec{v}$ is 0.