

Math 213 - 11.6 - Heat Seeking Kitten

Let $T(x,y) = x^2 - 2xy$ be the temperature at a point (x,y) in the region bounded by the curves $y = x$ and $y = x^2$. Suppose that a kitten is crawling around the region.

- a. At $\left(\frac{1}{2}, \frac{1}{3}\right)$, in which direction should the cat go to cool down as quickly as possible?
- b. At $\left(\frac{1}{2}, \frac{1}{3}\right)$, in what direction(s) should the kitten go to maintain its current temperature?
- c. Where is the hottest point in the region? Make a contour plot. Explain your answer.
- d. If, at $\left(\frac{1}{2}, \frac{1}{3}\right)$, the cat moves in such a way that for each change in its x direction of 2 units, the change in the y direction is -1 unit, find $\frac{dT}{dt}$, the change in the temperature, from the kitten's point of view.