

Homework 6, due Friday 2/25

1. p. 222, problems 2,4
2. For the functions in problem (1) determine $f(t, t)$ and $f(t, -t)$. Explain why the function $f(x, y) = x^2 + y^2 + 3xy$ does not have a local minimum at the point $(0, 0)$.
3. Let $f(x, y) = x^2 - y^4$. Show that $P = (0, 0)$ is a critical point, $\frac{\partial^2 f}{\partial x^2}(P) > 0$, and that the discriminant is zero. Furthermore explain why $P = (0, 0)$ is not a local minimum of $f(x, y)$.
4. p. 222, problem 5
5. p. 243, problem 2,3
6. Find the absolute maximum and minimum of $f(x, y) = 3x + 2y$ in the full circle $\{(x, y) | x^2 + y^2 \leq 4\}$ of radius 2.
7. p. 244, problem 13. Hint: write functions f (for the amount of metal) and g (for the volume) in terms of radius r and height h .
8. Find the point on the line $y = x + 2$ which is closest to the origin. Hint: Set $f(x, y) = x^2 + y^2 = \|(x, y)\|^2$ and $g(x, y) = x + 2 - y$. Explain why it is enough to find the minimum of $f(x, y)$ on the level set $g(x, y) = 0$.