

Fundamental Mathematics for Robotics
Homework Set #12, Dr.T

- [1] Find local minimum(s), local maximum(s), and inflection point(s) of the following functions if they exist:
- (a) $f(x) = 2x^3 + 3x^2 - 36x + 8$
 - (b) $x(t) = 5t^2 + (15 - 2t^2)$
 - (c) $f(x, y) = x^2 + 2xy + 2y^2 - 6x - 4y + 6$
 - (d) $f(x, y) = 5x^2 + 6xy + 2y^2 - 14x - 8y + 10$
 - (e) (Extra) $f(x, y) = Ax^2 + 2Bxy + Cy^2 - 2Dx - 2Ey + F$ (all coefficients are positive) Hint: You need to break down into cases.
- [2] Repeat Problem [1] with the following functions:
- (a) $f(x) = 2(x - 1)/(x^2 + 4)$
 - (b) $f(x) = (x^2 - 2x + 1)/(x^2 - 2x + 5)$
 - (c) $f(x) = 3(x - 2)^2/(x^2 + 4)$
- [3] This time, let you make your own polynomial functions $p(x)$ that has the following property. Here, the domain is the whole real number, $-\infty$ to ∞ .
- (a) 1 local minimum and 1 local maximum.
 - (b) 1 global maximum, 1 local maximum, and 1 local minimum.
 - (c)
- [4] Repeat Problem [3] using functions other than the polynomials.