3. (18 points)

(a) (2 pts) If $f(x) = ax^4 - x^3 + d$ $(a \neq 0)$ and f has a global maximum, what must be the sign of a? Explain.

(b) (4 pts) Determine all critical points of f.

(c) (4 pts) For what value of x does the maximum occur? Show your work.

(d) (4 pts) For what value(s) of x (if any) does f have inflection points?

(e) (4 pts) If $f(0) = 4$ and f has a critical point at $x = -\frac{1}{4}$, determine a formula for $f(x)$.