MAT331 homework problems

NOTE: Neither of these problems involve Maple, except as a word processor to write your solution. If you like, you are welcome to turn in a printed or handwritten version, if you are more comfortable with that.

11. *(expires 2/25)* Following Section 4 of the notes, prove that if we describe the circle of center \((a, b)\) and radius \(r\) using the parameters \((a, b, k)\), with \(k = a^2 + b^2 - r^2\), rather than the more natural parameters \((a, b, r)\), then the error function \(H(a, b, k) = E(a, b, \sqrt{a^2 + b^2 - k})\) is quadratic in \(a, b\) and \(k\). What does this imply about the number of critical points?

12. *(expires 2/25)* With reference to Problem #11, show that, for \(r > 0\), the transformation \((a, b, r) \mapsto (a, b, k)\) is a valid change of variables, that is, it is one-to-one. This should help you prove that \(E(a, b, r)\) has only one “physical” critical point, which is a minimum, and is mapped, through the transformation, into the unique critical point of \(H(a, b, k)\).