Worksheet: A Newton's method example

1. (a) Consider the equation

$$e^x + x^2 = 7.$$

(*I don't know how to solve it by hand and I bet you don't either.*) Start to understand it by rewriting it as

$$F(x) = G(x)$$

for functions which you know how to graph. (*The graphs* y = F(x) *and* y = G(x) *should be pretty easy or from memory.*) Draw these graphs and estimate their intersection point(s).

(b) Pick one approximated intersection point from part (a). This will be the initial estimate x_1 for Newton's method to solve equation (1). Rewrite equation (1) as f(x) = 0 and set up Newton's method. This will be a rule in the form

$$x_{n+1} = \left(\dots \text{ formula with } x_n \text{ in it } \dots \right)$$

(c) If you have a calculator-like-device (e.g. smart phone), compute x_2 and x_3 as decimals. Otherwise, write down x_2 as specifically as you can.

2. (*Different problem!*) For solving $7 - x^2 = 0$ with Newton's method, find a starting point x_1 for which Newton's method fails immediately and you can't compute x_2 .