Problem 2 (10 points):

a) Christelle is doing her homework and applying Newton's method to find the zero of a function. She must find the zero to the nearest hundredth. She applies the algorithm flawlessly and gets:

$$\begin{aligned} c_0 &= 2 \\ c_1 &= 2.54678349 \\ c_2 &= 2.67429470 \\ c_3 &= 2.60382049 \\ c_4 &= 2.60840384 \\ c_5 &= 2.60839403 \\ c_6 &= 2.60838593 \end{aligned}$$

What is her answer? And after which guess could she have stopped applying the algorithm, and still been certain that her answer was right?

answer: 2.61

could have stopped after c_5.

b) Christelle needs to find a zero of the function $f(x) = 2x^2 - 4x + 1$. Since $f(1) = -1$ and $f(2) = 1$, she knows that there is a zero in the interval $[1, 2]$. Give a number that she could use as her c_0, and that would eventually lead her to finding the zero. (There are infinitely many correct answers, you just need to give one!)

anything but 1! if you pick 1 as your first guess, $f'(1) = 0$ so you can't keep going.

c) On her last problem about Newton's method, Christelle applies the method flawlessly and gets the following results:

$$\begin{aligned} c_0 &= 2 \\ c_1 &= 1 \\ c_2 &= 2 \\ c_3 &= 1 \end{aligned}$$

What should she do? (The answer is not to drop the class or skip this problem!)

(see p 760 for a picture of how this might happen).

Best answer: choose a different initial guess

Also good: draw a picture.