Due in two weeks!

The first problem is writing a function to do a specific task/calculation(s), while the second problem then uses your function to answer questions for an application.

1. Write an m-file, called `newton.m`, that uses Newton’s Method to find an approximate solution to the equation $f(x) = 0$, for a given function $f$. Your input should be:
   - the function $f$,
   - its derivative $\frac{df}{dx}$,
   - an initial guess $x_1$ for the solution,
   - the desired accuracy,
   - and the maximum number of iterations allowed (so it will stop if accuracy cannot be reached).

   Note: the user must input the function and derivative, MATLAB should not be used to find the derivative of $f$. The output should be the approximation to the solution of $f(x) = 0$. Your code should iterate until the absolute value of the difference between the last two iterations is less than the desired tolerance/accuracy OR the maximum number of iterations has been reached – in either case, an appropriate message should be printed on the screen (use either `disp` or `fprintf` - experiment with this). The output of your function is the LAST iterate. Test your function for correctness by choosing to solve an equation of your choice (with a known solution).

2. A car dealer sells a new car for $23,275. She also offers to sell the same car for payments of $475 per month for five years. What monthly interest rate is this dealer charging?

To solve this problem, you will need to use the formula for the present value $A$ of an annuity consisting of $n$ equal payments of size $R$ with an interest rate $x$ per time period:

$$A = \frac{R}{x} \left[1 - (1 + x)^{-n}\right].$$

(a) For the above situation, get a polynomial of $x$ (simplified as much as possible) that is set to 0 that we would need to solve to find the interest rate $x$.

(b) Graph the polynomial to find an interval that contains a positive root and a good initial guess for the interest rate. (Make a clear, good graph – maybe with `grid on`).

(c) Use Newton’s method and the initial guess from part (b) to solve the equation to find the monthly interest rate.

(d) What is the yearly interest rate (compounded monthly)? Hint: Think of a loan with principle $P$ and interest rate $x$ which is compounded monthly (and $x$ is the monthly interest rate). After one year, we’d be looking at the amount: $P(1 + x)^{12}$. But if we were looking at a yearly interest rate being $r$, we’d be looking at the amount being: $P(1 + r)$. After one year, these quantities should be equal for the same principle $P$. So take these, form an equation and from your $x$ in part c, solve for $r$.

To turn in:

- your m-files (e-mailed). One is your `newton.m`, one is a script file testing your function, and script files for #2b, c. These files should be named `newton.m`, `hw6_1.m`, `hw6_2b.m`, `hw6_2c.m`

- Answers to #2acd (on paper). Note: each part of #2 needs an answer except part (b), which needs a graph. Work should be shown for your answers to #2a, #2d.

- The graph for #2b, saved as JPG and emailed. This graph should be appropriately titled and such.