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 $\dfrac{df}{dx}$,
   - 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:

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

   (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.