**What to Submit:**

For this project you will need to create and submit a single script m-file called `project2.m`. This file should do all of the things requested in the problems below in the order specified.

**Grading Method:**

For grading we will run this m-file through Matlab.

If there are any unexpected errors then the project will automatically earn a grade of 0 so make sure you run your m-file through Matlab and check the output before submitting! Be very careful about making sure that any necessary symbolic variables are defined in your code. The assumption should be that we will run your m-file through a clear matlab process. Assuming your script m-file goes through we will grade each question as correct or incorrect based upon its output. Point values are specified, remaining point values are for details like the file name and using a single Matlab entry where requested.

You do not need to number the problems in any way, just be sure to include them in your m-file in the order they are listed below.

The phrase *single Matlab entry* means a Matlab command or compound command on a single line with no semicolons separating commands. For example the first of the following is acceptable while the second is not, even though both do the same thing.

Acceptable: `log(asind(0.5))`

Unacceptable: `asind(0.5);log(ans)`

The point of asking for answers like this is to make sure you are able to construct useful compound commands. Any question which does not request a single Matlab entry can be done on as many lines as you wish.

**The Problems:**

Each of the following should be done with a *single Matlab entry* unless otherwise specified. Declare symbolic variables as needed wherever you wish.

1. Clear out Matlab. [2 pts]

2. Evaluate $\frac{d}{dx}\left[\cot^{-1}(x^2 - x)\right]$. [5 pts]

3. The distance traveled by an object is dictated by the function $r(t) = t^2 e^{2t}$. Find the accelera-tion of the object at $t = 2$. [5 pts]

4. Evaluate $\int x^3 \sin x \ dx$ with `int`. [5 pts]

5. Use `int` to find the area under the sine curve from $x = 0$ to $x = \frac{\pi}{6}$. [5 pts]

6. Use `int` to evaluate the integral whose result is the area between the functions $y = x^2 + 3$ and $y = 2x + 10$. How you find the interval of integration is up to you and is not part of this assignment but the interval should be exact. [10 pts]

7. If an object has velocity given by $v(t) = \sqrt{t^3 + t}$, use `quad` to approximate the distance the object travels between $t = 0$ and $t = 10$. [10 pts]

8. Solve the first-order initial value problem $\frac{dy}{dt} - ty = t$ with $y(0) = 1$. [10 pts]

9. A population with quantity $p(t)$ at time $t$ grows at a continuously compounded rate equal to 2.3% of the current population and begins at $p(0) = 200$. Use `dsolve` wrapped in `subs` to solve the corresponding initial value problem and find the population at time $t = 10$. [15 pts]

10. Plot the solution to the initial value problem $\frac{dy}{dt} = 0.2y(y - 500)$ with $y(0) = 10$ using `dsolve` wrapped in `ezplot`. [15 pts]

11. (a) Declare the function $f(x) = x\sqrt{x^2 + 12}$ symbolically. [5 pts]
    (b) Evaluate $f(2)$. [5 pts]
    (c) Evaluate $f'(2)$. [5 pts]
    (d) Evaluate $\int_0^2 f(x) \ dx$. [5 pts]
    (e) Plot $f(x)$ using `ezplot`. [5 pts]

12. (a) Declare the function $g(x) = \frac{x-1}{x^2+2}$ with a function handle. Note: Use `.^` and `./` in light of question (d). [5 pts]
    (b) Evaluate $g(5)$. [5 pts]
    (c) Evaluate $g'(5)$. [5 pts]
    (d) Use `quad` to approximate $\int_0^2 g(x) \ dx$. [5 pts]

13. Use a three-line `for` loop with `disp` to print your last name the number of times equal to your age in years. [10 pts]

14. Use a three-line `for` loop with `disp` to find $\int_0^a x^2 \ dx$ for $a = 0, 1, 2, 3, 4, 5$. [10 pts]

15. (a) Define the function $f(x) = x^2 e^{3x}$ as a function handle. [5 pts]
    (b) Use a three-line `for` loop to find and display the first five derivatives of $f(x)$. [10 pts]

16. (a) Initiate $A$ to equal your age in years. [2 pts]

(b) Use a three-line `for` loop to divide $A$ in half seven times (actually changing the value of $A$) but don't display anything. [10 pts]

(c) After the loop use `disp` to display the final value of $A$. [2 pts]

17. (a) Initiate $A$ to equal to the year you were born. [2 pts]

(b) Use a three-line `while` loop to set $A$ equal to $\sqrt{A}$ while the value of $A$ is greater than 2 but don't display anything. In other words keep taking square roots until the result is less than or equal to 2. [10 pts]

(c) After the loop use `disp` to display the final value of $A$. [2 pts]