

Fall 2015 * Math 430 * Math 635

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Homework 1

Please explain all steps in your work briefly

1. Make a *rough* sketch of these function curves, using your knowledge of elementary functions (in part “b”, you may also need to review the concept of a limit):

$$(a) \quad y(x) = \frac{1}{1 + \exp(-x)}$$

$$(b) \quad Y(t) = \frac{\sin t}{t}$$

2. Differentiate this function: $Y(t) = t \sin(t \cos(t^2))$

3. Use substitution to take these integrals:

$$a) \quad \int_0^{\pi/2} e^{-\cos t} \sin t \, dt$$

$$b) \quad \int_0^1 \frac{e^x \, dx}{1 + e^{2x}}$$

4. What function does the following MATLAB program compute? (hint: it’s a Taylor series). To explain how this program works, track the value of variables “k”, “term” and “F” for a couple iterations of the “while” loop.

```
function F = someFunction(x)
F = 1;
term = 1;
k = 1;
while term > 1e-6
    term = term * x / k;
    F = F + term;
    k = k + 1;
end;
```

5. Solve the following differential equation (you can simply guess, using your knowledge of elementary functions)

$$\begin{cases} \frac{d^2 Y}{dt^2} + 4Y(t) = 0 \\ Y(0) = 1, Y'(0) = 0 \end{cases}$$