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Section A
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Problem 1

```
clear all; close all; clc

x=3.1416
y=3.14159265358979323846264338327950288419 7
z=pi

x-z
y-z
```

a) When MATLAB displays these numbers (in the command window), x y and z all return as 3.1416. In the workspace, x is stored as what was put in, but y and z are stored with the same number of digits, with y being cut off at the 15th decimal place.
b) In MATLAB, x-z is nonzero and returns 7.3464e-06 , while y-z is zero. x-z returning a nonzero value is not surprising, because the variable x that was assigned has 5 digits, while the variable z which was assigned pi is stored in MATLAB with more digits. y-z returning a zero value is also not surprising because the variable y we assigned to approximate pi had many more digits closer to the number of digits that MATLAB stores.
c) MATLAB stores up to 15 decimal places/16 digits. Since x contained 4 decimal places and the line x-z returned a nonzero value, while y contained 39 decimal places and y-z returned a zero, the number of decimal places that MATLAB stores in pi can be found by determining the values at which an estimation of pi-value went from a nonzero to a zero value. Thus, with a variable, say, k, that is assigned to an approximation of pi with decimal values less than 15, the line k-z returns a nonzero value. But when the number of decimal places the variable k is approximated to is 15 or more, the line k-z returns zero. (This can be done with a loop and if/else if statements but I did it quickly enough without). MATLAB by default stores numbers with 16 digits of precision (which can be seen in its use of scientific notation for very large numbers), so it is not particular to pi and can be an issue if you are running some very large calculation such as a loop that runs hundreds of times for a very large number.

Problem 2

```
clear all; close all; clc

x=(0:0.1:5);

y=sin(x)
T1=x;
T2=T1-x.^3/factorial(3);
T3=T2+x.^5/factorial(5);
T4=T3-x.^7/factorial(7);

hold on
plot(x,y,'r')
plot(x,T1,'b')
plot(x,T2,'g')
plot(x,T3,'y')
plot(x,T4,'k')
hold off

xlabel("x-axis")
ylabel("y-axis")
title("Sin(x) and Taylor approximations of Sin(x)")
legend('y','T1','T2','T3','T4','location','northwest')
```