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Homework 9

ENGR 133-003 Created by Sean DeBarr 3/29/2019

```
clear
close all
clc
```

Problem T9.1-1

```
clear

disp("**********************" + newline + "Problem T9.1-1" + newline);

% declare variables
t = 0:10;
a = [0, 2, 4, 7, 11, 17, 24, 32, 41, 48, 51];

% preallocate for extra speed
d = zeros(1, 10);
v = zeros(1, 10);

% set initial value to 0
v(1) = 0;
d(1) = 0;

% calculate velocity and distance
for (k = 1:10)
    v(k + 1) = trapz(t(k:k + 1), a(k:k + 1)) + v(k);
    d(k + 1) = trapz(t(k:k + 1), v(k:k + 1)) + d(k);
end

% display results in table form
fprintf("Time (t)[sec] vs Distance (d)[m]:\n");
disp([t', d']);

% The final displacement in the textbook is wrong because when you run
% the code, the velocity at 9 sec is 117.5, but the book has it as
 being
% 117. Therefore, my values are slightly different.

**********
```

```
Problem T9.1-1

Time (t)[sec] vs Distance (d)[m]:
         0         0
    1.0000    0.5000
    2.0000    3.0000
    3.0000    9.7500
    4.0000   23.7500
    5.0000   49.2500
    6.0000   92.0000
    7.0000  159.0000
    8.0000  258.2500
    9.0000  398.0000
   10.0000  584.7500
```

Problem T9.1-2

```
clear

disp("**********************" + newline + "Problem T9.1-2" + newline);

% calculate integral
A = integral(@(x) 1 ./ x, 2, 5);

% display results
fprintf("A = %.4f, which is the same solution as the\n", A);
fprintf("closed-form solution, which is A = 0.9163.\n\n");
```

```
**********************
Problem T9.1-2

A = 0.9163, which is the same solution as the
closed-form solution, which is A = 0.9163.
```

Problem 9.3

```
clear

disp("**********************" + newline + "Problem 9.3" + newline);

% declare variables
t = 0:4;
a = 7 .* t;

% preallocate for extra speed
d = zeros(1, 4);
v = zeros(1, 4);

% set initial value to 3
v(1) = 3;
```

```
% set initial value to 0
d(1) = 0;

% calculate velocity and distance
for (k = 1:4)
    v(k + 1) = trapz(t(k:k + 1), a(k:k + 1)) + v(k);
    d(k + 1) = trapz(t(k:k + 1), v(k:k + 1)) + d(k);
end

% display results
fprintf("The total distance the object travels in 4s is %gm.\n\n",
 d(5));
```

```
**********
Problem 9.3

The total distance the object travels in 4s is 89m.
```

Problem 9.6

```
clear

disp("**********" + newline + "Problem 9.6" + newline);

% declare variables
t = 0:10;
v = [0, 2, 5, 7, 9, 12, 15, 18, 22, 20, 17];
d(1) = 3;

% calculate position
for (k = 1:10)
    d(k + 1) = trapz(t(k:k + 1), v(k:k + 1)) + d(k);
end

% display results
fprintf("The objects position at t = 10s is %gm.\n\n", d(11));
```

```
**********
Problem 9.6

The objects position at t = 10s is 121.5m.
```

Problem 9.9

```
clear

disp("**********" + newline + "Problem 9.9" + newline);

% declare variables and force
t = 0:5;
F = @(t) (500 .* (2 - exp(-t) .* sin(5 * pi .* t)));
```

```
% calculate accelaration
A = @(t) (F(t) / 100);

% calculate velocity
velocity = integral(A, 0, 5);

% display results
fprintf("The objects velocity at t = 5s is %gm.\n\n", velocity);
```

```
**********
Problem 9.9

The objects velocity at t = 5s is 49.6808m.
```

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