

ECE 761 - Homework #1

Animation in Matlab & Matrix Operations

1. Load 2-weeks worth of wind-speed data centered on your birthdate from NDAWN. (close to your home town if you're from North Dakota). Plot this in MATLAB as wind speed vs hour.
2. Assume a Siemens SWT-2.3-101 wind turbine is used to generate wind energy where the wind-speed vs. energy is given in the following curve:

source: http://www.energy.siemens.com/hq/pool/hq/power-generation/wind-power/SWT-2%203-101_brochure_EN_022012.pdf

- 3a) Determine a function in Matlab to approximate this curve.
- 3b) Use this function to compute how much power a Siemens SWT-2.3-101 wind turbine would produce from the wind data your found in problem 2.

4. Assume each pound of coal produces 1kWh of electricity. How many pounds of coal is this two weeks equivalent to ?

source: (<https://www.eia.gov/tools/faqs/faq.cfm?id=667&t=2>)

Problem 5-8) Norther Tool sells a solar panel for \$3166. Is this a good investment for Fargo?



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- 5) Find the solar radiation for Fargo, ND for the past year from NDAWN.
- 6) In Matlab, convert this to how many kWh this would produce.
- 7) At \$0.10 / kWh, how many years would it take for this solar panel to pay for itself?

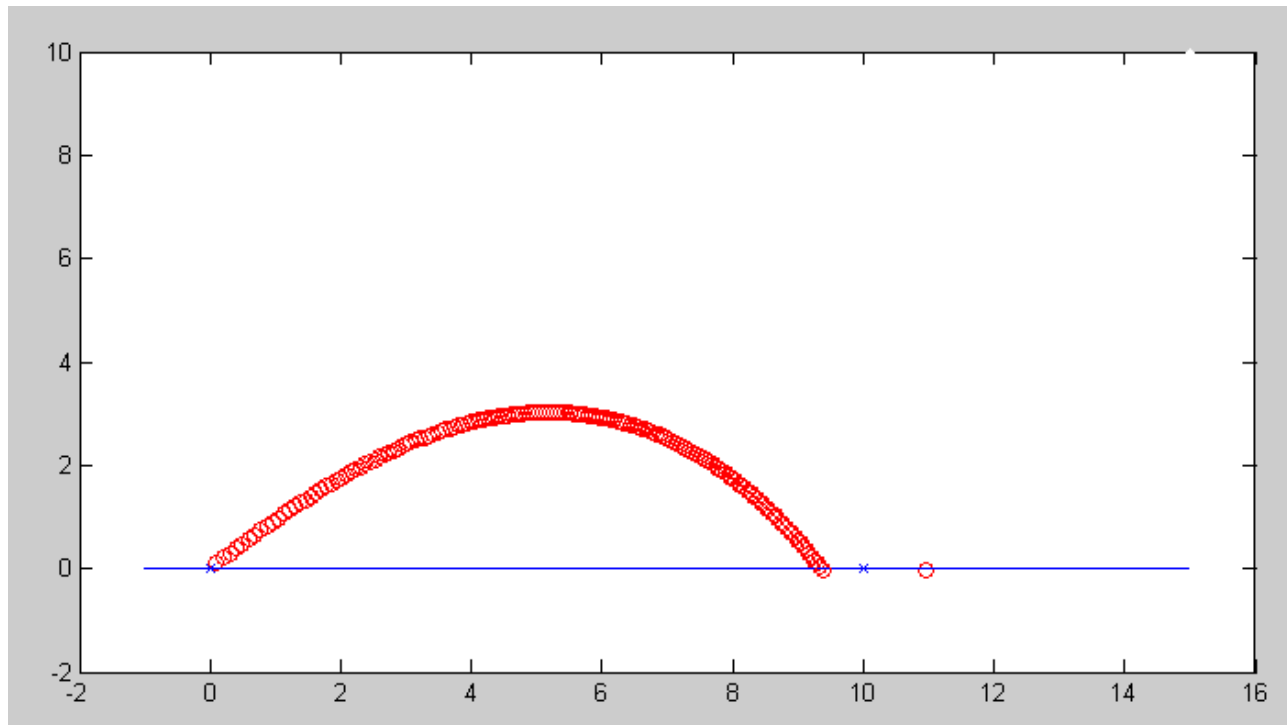
8) The following Matlab code generates a game where you launch a tennis ball from the origin (0,0) and try to hit a target.

The calling routine (if you save this file as shoot.m) is

```
>> shoot(10)
Angle: 50
Speed: 11
Error is
```

2.0908

Angle:



If you miss by more than 0.1, you are asked for another angle and speed.

Pick a random spot for the target.

Define a way to hit the target in less than four shots.

```

function [Shots] = shoot(Target)

Shots = 0;
Error = 10;

while(Error > 0.1)
    Shots = Shots + 1;

    Angle = input('Angle: ');
    Speed = input('Speed: ');

    x = 0;
    y = 0;

    Q = Angle*pi/180;

    dx = Speed*cos(Q);
    dy = Speed*sin(Q);

    dt = 0.01;

    while(y >= 0)

        % wind drag
        V = sqrt(dx^2 + dy^2);
        Fwind = -0.01 * V^3;

        Fx = Fwind * (dx / sqrt(dx^2 + dy^2));
        Fy = Fwind * (dy / sqrt(dy^2 + dx^2));

        ddx = Fx;
        ddy = Fy - 9.8;

        dx = dx + ddx*dt;
        dy = dy + ddy*dt;

        x = x + dx*dt;
        y = y + dy*dt;

        clf
        plot([-1,15],[-1,10],'w. ');
        hold on;

        plot([-1,15],[0,0],'b- ');
        plot([0,Target],[0,0],'bx ');

        plot(x,y,'ro ');
        pause(0.01);

    end

    disp('Error is '); x - Target

    Error = abs(x-Target);

end

disp('Number of Shots:'); Shots

end

```