Tutorial #1

**Problem 2.8**:

55mph

2 miles, 1.5 mins later, 50mph

speed limit = 60m/h

distance = 2

time = 90

speed = distance / time

start = 55/3600 m/s

end = 50/3600 m/s

dist = 0, speed = 55/3600

dist = 2, speed = 50/3600

graph distance / time

mean = f’(c) = (f(b) - f(a)) / (b - a) = (2 - 0) / (1.5m - 0) = 2 / 0.025hrs = 80m/h

An aircraft begins its descent at a distance x = L (it touches down at x = 0) and an altitude of H.

A cubic polynomial is used to describe the landing y = ax3 + bx2 + cx + d, where:

* y = altitude
* x = horizontal distance to the aircraft

The aircraft starts and finished the landing at level positions.

Find a, b, c, d

H = aL3 + bL2 + cL + d

0 = a03 + b02 + c0 + d ⇒ **d = 0**

y = ax3 + bx2 + cx

dy/dx = 3ax2 + 2bx + c

3a(0)2 + 2b(0) + c = 0 ⇒ **c = 0** plane is not descending at touchdown

y = ax3 + bx2

dy/dx = 3aL2 + 2bL = 0

3aL2 = -2bL

3aL = -2b

**b = 3aL/-2**

y = ax3 - 3aLx2/2

H = aL3 - 3aL(L)2/2

⇒ **a = -2H/L3**

Rope length = 10

Side of square = x

Total area to be kept to a minimum

How much rope for the square and how much for circle?

2 equations in X and R

4x + 2πr = 10 circumference of both shapes = 10m

x2 + πr2 = A area of both shapes is to be minimum

⇒ A(x) = x2 + π((10-4x)/2π)2