

Here's a launcher idea, springs! I was talking to Triple today and thought a little bit about those Physics Elastics Launchers that we used to do experiments with. Other factors notwithstanding, I think it may actually be reasonable to use a spring-fired projectile system, and here's why.

1 | Proving Myself

We are not going to use calculus because that's so 18th century. Instead, we treat everything linearly. Take that, Newton.

$$F_{elastic} = -k\Delta x \quad (1)$$

$$F_{gravity} = mg \quad (2)$$

1.1 | At the point of Launch

$$PE_{elastic} = \frac{1}{2}K\Delta x^2 \quad (3)$$

Ok I lied, this needs a bit of calculus to proof. But to uphold my honour of "no calculus" I am going to leave that as an exercise to the reader. Think about the spring force as the Height of a right triangle of base Δx , and the Work is the area of that triangle.

And of course,

$$KE_{translational} = \frac{1}{2}mv^2 \quad (4)$$

We again ignore rotational kinetic energy because it's not like I am taking advanced mechanics or something. So, at launch, we know that our conditions are:

$$mv^2 = k\Delta x^2 \quad (5)$$

$$v^2 = \frac{k\Delta x^2}{m} \quad (6)$$

Hence, given a mass m (kg), a spring constant k ($\frac{N}{m}$), and a displacement Δx (m), we could figure the velocity at which the projectile is going/needs to go.

1.2 | To get to the air.

Let's get to 150 metres!

We know that:

$$PE_{grav} = mg\Delta h \quad (7)$$

$$= 150gm \quad (8)$$

To reach this height, we therefore have to contribute $150gm$ joules worth of energy. To make all of this energy come from moving goodly, we will set that equal to kinetic energy of the object at the start of our experiment.

$$150gm = \frac{1}{2}mv^2 \quad (9)$$

$$150g = \frac{1}{2}v^2 \quad (10)$$

$$v^2 = 300g \quad (11)$$

1.3 | Launch, to Get to the Air

Putting the two together; that we need to "launch with enough velocity to get to the air."

$$\frac{k\Delta x^2}{m} = 300g \quad (12)$$

We will need to set $m = 250g = 0.25kg$, and $g = 9.8$.

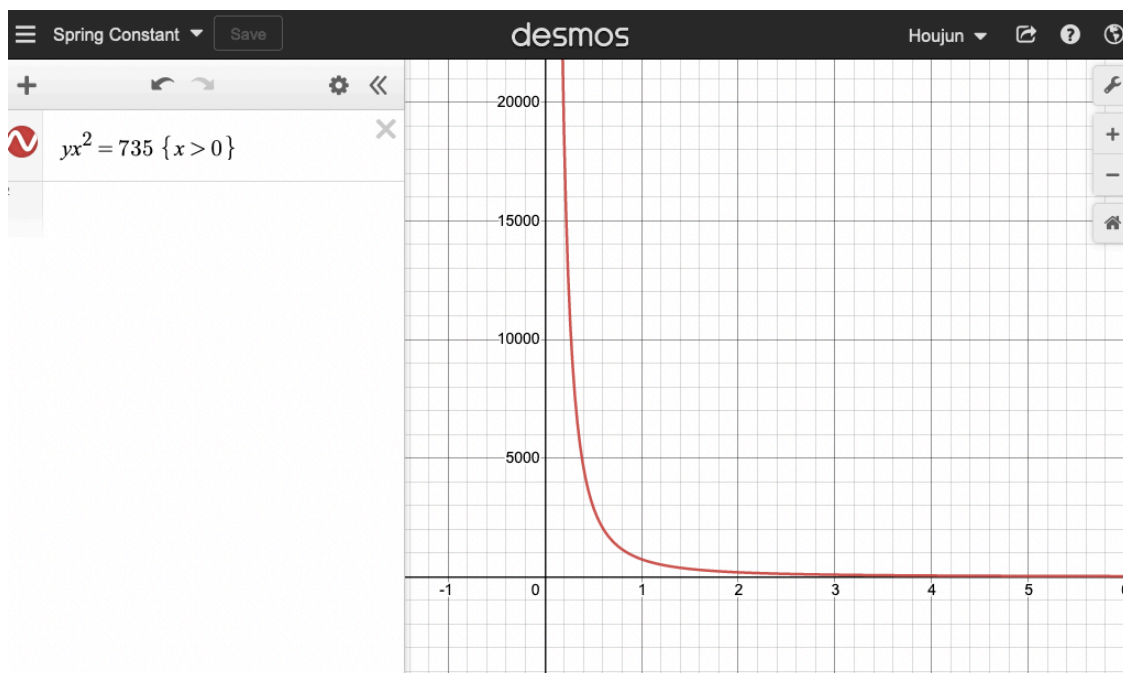
$$k\Delta x^2 = 0.25 \times 300 \times 9.8 \quad (13)$$

$$= 735 \quad (14)$$

We will set the solution set, with

$y = k$ and $x = x$ — such that, given a distance we wish to stretch the spring, we could figure the spring constant needed.

The graph is available here, and here's a screenshot:



A few noticing.

If we had, say, a typical rubber band (spring constant roughly 40 newtons per meter), the solution set tells us that we have to stretch it by 4 metres.

If we want to stretch/compress it by only a normal length (0.5m), our spring constant has to be roughly 2000 newtons a meter = 11 pounds/inch.

Looks like we *could* get >11lb/in springs. :tada!:

Now Hiring Spring Collers

Congratulations, you have a good spring design!

3rd Step Review Your Answers

Answers

Custom Part Number

Custom Part Number : AC038-500-4.000-MW-1.000-CG-N-IN

Your Design's Closest Stock Spring

Price	Stock Part Number	Inner Diameter (in.)	Free Length (in.)
View QTY Discounts \$18.73 Now \$10.13	View QTY Discounts PC044-500-5750-MW-0970-CG-N-IN	0.412	0.970

[View Results in Stock](#)

Rates & Loads

Spring Rate (or Spring constant), k : 15.189 Lbs/in

True Maximum Load, True F_{max} : 6.295 lbF

Maximum Load Considering Solid Height, Solid Height F_{max} : 6.295 lbF

Safe Travel

YOUR DESIGN'S SIMILAR STOCK SPRINGS

Price	Stock Part Number	Inner Diameter (in.)	Free Length (in.)
View QTY Discounts \$2.29 Now \$2.06	View QTY Discounts PC042-453-6000-MW-0922-C-N-IN	0.369	0.922
View QTY Discounts \$18.73 Now \$10.13	View QTY Discounts PC044-500-5750-MW-0970-CG-N-IN	0.412	0.970
View QTY Discounts \$3.12 Now \$2.80	View QTY Discounts PC045-484-7000-MW-1045-C-N-IN	0.394	1.045

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Why didn't I get an Instant Quote?

Some of the most common reasons for not generating an instant quote can be easily remedied by addressing on or more of the issues below. Please use the table to determine how to adjust your design to generate an instant quote. [Click here](#)

4th Step Warnings And Helpful Tips

Warning Messages

Your design has no warnings.

Helpful Tips

Here's the URL. So we just have to make a squishy compression thing that squishes the spring down and release all at once.