Mathematics 172 Homework, January 19, 2018.

Here are some problems related to what we did in class today. Recall that if we scale by a factor of λ. (That is we magnify by a factor of λ), and we are measuring in meters then

Things with units of m	scale with a factor of λ
Things with units of m^2	scale with a factor of λ^2
Things with units of M^3	scale with a factor of λ^3
Weight	scales with a factor of λ^3

1. A male domestic cat is 9.5 inches in height and weights 10 lbs. The height of a large male Siberian tiger is 43 inches. What would be the weight of a male domestic cat if it is scaled up to a height to 43 inches? *Solution:* The weight of the rescaled cat would be 927.331 lbs. For comparison the weight of a large Siberian tiger is 661 lbs.

2. The largest snake in the fossile record is th titanoboa which lived about 60 million years ago is what is not Columbia South America. The largest of these were about 42 feet long. Currently the largest boa in the world is the anaconda. The largest anaconda measured to date was 17.09 feet long and weighted 215 pounds. Assuming that the titanoboa is a scaled up version of an anaconda estimate the weight of a 42 foot titanoboa. *Solution:* The estimated weight would be 3191.245 lbs. (According to Wikipedia this estimate is too high, meaning that the titanoboa had a slimmer build than the anaconda.

3. A cell has a width of $W = 1.1 \times 10^{-6}$ m, a surface area of $A = 7.26 \times 10^{-12}$ m^2 and a volume of $V = 1.26445 \times 10^{18}$ m^3. If similarly shaped cell has a width of 1.7×10^{-6} m estimate its surface area and volume. *Solution:* The scaled surface are and volume are $A \approx 1.734 \times 10^{-11}$ m^2 and $V \approx 4.667 \times 10^{-18}$ m^3.