Take-home messages from today's interactive lecture:

- You can think about the differential dx as a small amount of x. While technically, it is an infinitesimally small amount, in practice it is almost always possible to think of it as just really, really small. By which, we mean small enough that any error you make by giving it a finite rather than infinitesmal size is too small to make a significant difference in your calculation. Much more about this in later activities.
- A differentials equation tells you how a small change in one variable is related to a small change in one or more other variables. You can interpret these equations geometrically with a figure.
- When doing algebra with differentials equations, you can think of each differential as a new variable.
- When you zap an equation with d, the resulting differentials equation is *linear* in the differentials, i.e. each of the differentials appears to the first power. This is an open invitation to do linear algebra to rearrange the equation.
- The dimensions of dx are the same as the dimensions of x. After all, dx is just a small amount of x.
- Every equation involving differentials should have matching factors of smallness in every term. For example:

$$dx = 2y^2\,dy \qquad \text{one factor of } d \text{ in every term} \tag{1}$$

$$dx\,dy = r\,dr\,d\theta \qquad \text{two factors of } d \text{ in every term} \tag{2}$$

  as opposed to:

$$\cancel{dx = 2y\,dy\,dz}$$