

MAT 305: Review #1

May 27, 2014

1. Create a new worksheet. Set the title to, “Review #1”.
2. Create a text cell (shift+click on blue line). Write your name, and this semester. Change it to some color. You can choose any color you like, as long as it’s not black. — Or white. White would be bad, too.
3. In the first computational cell, use the `var()` command to define variables x and h .
4. In the next few computational cells, have Sage expand the product $(x + h)^n$ for several values of n . The `expand()` command was shown in the notes, and you should pick at least 6 sequential values of n , such as $n = 1, 2, 3, \dots 6$.
5. Notice a pattern in the two terms of the expansion that have the largest powers of x . Formulate a conjecture as to what those two terms are, in terms of x , h , and n .
6. Notice also that there is a common factor for the other terms of the expansion. Formulate a conjecture as to what that common factor is, in terms of x , h , and n .
7. In Calculus, you learn that

- the definition of $\frac{d}{dx}f(x)$ is

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h},$$

- and $\frac{d}{dx}x^n = nx^{n-1}$.

In a final text cell, explain why your answers to steps 4–6 demonstrate this fact.