Extra Credit Writing 2 (Deadline February 26th, 11:59 PM)

This is worth at most 5 extra credit points.

Background. Here is something interesting: If you take the derivative of $\sin(x)$ enough times, you get back $\sin(x)$ again!

$$\sin' = \cos, \tag{14}$$
$$(\cos)' = -\sin, \tag{15}$$
$$(-\sin)' = -(\sin)' = -(\cos) = -\cos, \tag{16}$$
$$(-\cos)' = -(\cos)' = -(-\sin) = \sin. \tag{17}$$

That is, if you take the derviative *four* times, you get back sin. Another way to say this is that the fourth derivative of $\sin(x)$ is $\sin(x)$ again.

Prompt. Can you find other functions that have the property that their nth derivatives are themselves? For example, can you find

1. A function whose derivative is itself? (This is the case $n = 1$.)

2. A function whose *second* derivative is itself? (This is the case $n = 2$.)

3. How about for third derivatives?

4. Is there a function other than sin whose fourth derivative is itself? How many can you find?

And how about for other n?

Explore, discuss, have fun!

Grading. This is a writing assignment to get your juices flowing. You will *not* be graded on correctness, but you will be graded on how you are engaging with this question in a creative, or inquisitive, or interesting, or mathematical way. Be warned: Though you will not be graded on correctness, I *will* deduct credit if you do not make sense.

Example grading. If you hand in something magnificent, you will get 5 points. If you hand in something I find to be completely unrooted from reality or logic, I will give you a zero, and your grade in this class will be unaffected. (You may get a zero for other reasons, too; these are merely examples.)

Miscellaneous guidelines. Usual formatting guidelines. Upload on Canvas by the above indicated deadline.