Consider the following functions.

1. $f(x) = \sin(x)$
2. $f(x) = (1/x)$
3. $f(x) = \sqrt{x}$

There is a pattern in the derivatives of these function. We will discover and establish it.

(a) Compute the first, second, and third derivative of each of these functions.

(b) Propose a general formula for $f^{(n)}(x)$. This will be in terms of n.

(c) Verify the formula using a computer system. Check what the 10th derivative of the function is from your formula, then plug that into a computer system (Wolfram Alpha, for example) to see what it gives for the 10th derivative. They should match!

(d) **Bonus. Do not turn in.**Verify the proposed formula in two steps. Step 1 - verify the formula when $n = 1$. Step 2- assuming formula is true for a certain value of n, let us say for $n = k$, show that formula is valid for the next value of $n = k + 1$.

This last part is an elegant way of establishing the truth of statements like " for all n, something statement involving n is valid ". Convince yourself it works! This method is called ' mathematical induction'.