Complete the below 3 charts, similarly to the *Intro. to Taylor Polynomials* worksheet, which is posted (along with solutions) on the course homepage under `Selected Solutions`. Write your solutions so that the patterns for the $c_n$'s are easily recognizable (so leave factorials and constants raised to a power in your chart).

**Example 1.** Given the function $f(x) = \frac{1}{1-x}$ with center at $x_0 = 0$.

| Helpful Table for Example 1 | | | |
|---|---|---|---|
| $n$ | $f^{(n)}(x)$ | $f^{(n)}(x_0) \overset{\text{here}}{=} f^{(n)}(0)$ | $c_n \overset{\text{def}}{=} \frac{f^{(n)}(x_0)}{n!} \overset{\text{here}}{=} \frac{f^{(n)}(0)}{n!}$ |
| 0 | $(1-x)^{-1}$ | $(1-0)^{-1} = 1$ | $\frac{1}{0!} \overset{\text{note}}{=} \frac{0!}{0!} = 1$ |
| 1 | $-(1-x)^{-2}(-1) = (1-x)^{-2}$ | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |

**Example 2.** Given the function $f(x) = \sin x$ with center at $x_0 = \pi$.

| Helpful Table for Example 2 | | | |
|---|---|---|---|
| $n$ | $f^{(n)}(x)$ | $f^{(n)}(x_0) \overset{\text{here}}{=} f^{(n)}(\pi)$ | $c_n \overset{\text{def}}{=} \frac{f^{(n)}(x_0)}{n!} \overset{\text{here}}{=} \frac{f^{(n)}(\pi)}{n!}$ |
| 0 | $\sin x$ | $\sin \pi = 0$ | |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |

► Note $f^{(4)}(x) = f^{(0)}(x)$ so the derivatives $y = f^{(n)}(x)$ repeat/cycle in sets of 4.

**Example 3.** Given the function $f(x) = \ln(1+x)$ with center $x_0 = 0$.

| Helpful Table for Example 3 | | | |
|---|---|---|---|
| $n$ | $f^{(n)}(x)$ | $f^{(n)}(x_0) \overset{\text{here}}{=} f^{(n)}(0)$ | $c_n \overset{\text{def}}{=} \frac{f^{(n)}(x_0)}{n!} \overset{\text{here}}{=} \frac{f^{(n)}(0)}{n!}$ |
| 0 | $\ln(1+x)$ | | |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |