Power Series

While working in a group make sure you:

- Expect to make mistakes but be sure to reflect/learn from them!
- Are civil and are aware of your impact on others.
- Assume and engage with the strongest argument while assuming best intent.

1. Let $f(x) = e^x$.

   (a) Find a third degree polynomial to approximate $f(x)$.

   (b) Use the third degree polynomial to approximate $f(.1)$

The n^{th} Taylor polynomial for f at $c = 0$ (also known as Maclaurin Series) is:

$$\sum_{i=0}^{n} \frac{1}{i!} f^{(i)}(0) x^i$$

The n^{th} Taylor polynomial for f at c is:

$$\sum_{i=0}^{n} \frac{1}{i!} f^{(i)}(c)(x-c)^i$$

2. Expand the first three terms in the n^{th} Taylor polynomial for f at c.

3. Find the 2nd & 4th Taylor polynomial of f at $\frac{\pi}{2}$ if we know:
   $f(\frac{\pi}{2}) = 1 \qquad f'(\frac{\pi}{2}) = 0 \qquad f''(\frac{\pi}{2}) = -1 \qquad f^{(3)}(\frac{\pi}{2}) = 0 \qquad f^{(4)}(\frac{\pi}{2}) = 1$

4. Let $g(x) = \ln(x)$. What constant might it make sense to center our Taylor polynomials at? Justify your choice.