MATH 122 - Activity Power Series

A. Consider the series:

$$(x-1) - \frac{(x-1)^2}{2} + \frac{(x-1)^3}{3} - \frac{(x-1)^4}{4} + \frac{(x-1)^5}{5} - \dots$$

1. What is the center for this series?
2. Write down the general term for this series.
3. On a computer go to desmos.com/calculator and graph the first seven partial sums on the same graph:

$$S_1 = (x-1), \quad S_2 = (x-1) - \frac{(x-1)^2}{2}, \quad S_3 = (x-1) - \frac{(x-1)^2}{2} + \frac{(x-1)^3}{3} \dots$$

4. Discuss what you see. For what x-values do the partial sums seem to be converging (approaching the same number)? For what x-values are the partial sums diverging?
5. Now use the Ratio Test to find the Radius of Convergence.
6. How does the Radius of Convergence compare to your graph?

Now repeat this exercise for the following examples:

B.

$$\frac{(x-1)}{3} - \frac{(x-1)^2}{2 \cdot 3^2} + \frac{(x-1)^3}{3 \cdot 3^3} - \frac{(x-1)^4}{4 \cdot 3^4} + \dots$$

C.

$$x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \frac{x^5}{5!} + \dots$$

NOTE: You may need to graph more than S_7 to get a better idea of what is happening for $x < 0$.

D.

$$1 + 2^2x^2 + 2^4x^4 + 2^6x^6 + \dots$$

NOTE: You will need to be careful how you write your general term.
In order to use the ratio test you need $n = 1, 2, 3, 4, ...$ not skipping values.