Power Series (12.4)

Recall from Precalc: $6 + 6x + 6x^2 + 6x^3 + 6x^4 + \ldots\ldots$ is an infinite geometric series.
It converges if: its sum is:

The transcendental functions: e^x, sin x, cos x, ln x, etc. can be written as infinite power series too!
Graph $y = x - 1/3!\, x^3 + 1/5!\, x^5 - 1/7!\, x^7 + 1/9!\, x^9 - 1/11!\, x^{11} + \ldots\ldots$
in the interval from 0 to 2π.

As you include an infinite number of terms in the series, what does the graph look like?

Power Series: $P(x) = c_0 + c_1x + c_2x^2 + c_3x^3 + c_4x^4 + c_5x^5 + c_6x^6 + \ldots\ldots$

1. Show that the first 3 terms of the power series above expanded about x = 0 is sinx.

$P(x) = c_0 + c_1x + c_2x^2 + c_3x^3 + c_4x^4 + c_5x^5 + c_6x^6 + \ldots\ldots$ $P(0) =$

$P'(x) =$ $P'(0) =$

$P''(x) =$ $P''(0) =$

$P'''(x) =$ $P'''(0) =$

$P^{(4)}(x) =$ $P^{(4)}(0) =$

$P^{(5)}(x) =$ $P^{(5)}(0) =$

$f(x) = \sin x$ $f(0) =$

$f'(x) =$ $f'(0) =$

$f''(x) =$ $f''(0) =$

$f'''(x) =$ $f'''(0) =$

$f^{(4)}(x) =$ $f^{(4)}(0) =$

$f^{(5)}(x) =$ $f^{(5)}(0) =$

2. Write sigma notation for the infinite series:

$y = x - 1/3!\,x^3 + 1/5!\,x^5 - 1/7!\,x^7 + 1/9!\,x^9 - 1/11!\,x^{11} + \ldots.$

3. We want to look at the "partial sums", notated S_1, S_2, S_3, etc. Because we start the indexing at $n = 0$, you have to think a little bit. ☺

4. Plot the 6^{th} partial sum. Note that this is notated ______

5. Find the interval of x-values for which the 6^{th} partial sum is within 0.0001 units of the function sin x.

#3c)

how many terms...

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