

MathQuest: Series

Taylor Series

- Find the Taylor series for the function $\ln(x)$ at the point $a = 1$. (No calculators allowed.)
 - $(x - 1) - \frac{1}{2}(x - 1)^2 + \frac{1}{3}(x - 1)^3 - \frac{1}{4}(x - 1)^4 + \dots$
 - $(x - 1) - (x - 1)^2 + 2(x - 1)^3 - 6(x - 1)^4 + \dots$
 - $\ln(x) + \frac{1}{x}(x - 1) - \frac{1}{x^2}(x - 1)^2 + \frac{2}{x^3}(x - 1)^3 - \frac{6}{x^4}(x - 1)^4 + \dots$
 - $\ln(x) + \frac{1}{x}(x - 1) - \frac{1}{2x^2}(x - 1)^2 + \frac{1}{3x^3}(x - 1)^3 - \frac{1}{4x^4}(x - 1)^4 + \dots$
 - This is not possible.
- If $a = 0$, what function is represented by the Taylor series $1 - \frac{x^2}{2} + \frac{x^4}{24} - \frac{x^6}{720} + \dots$? (No calculators allowed.)
 - e^x
 - $\sin x$
 - $\cos x$
 - This is not a Taylor series.
- A Taylor series converges when $x = 12, 13$ and 15 , but diverges when $x = 9, 16$ and 18 . Which of the following could be a , the point where the Taylor series is centered?
 - $a = 9$
 - $a = 11$
 - $a = 13$
 - $a = 15$
 - All of the above are possible.
 - None of the above are possible.
- Suppose we find a Taylor series for the function $f(x)$ centered at the point $a = 5$. Where would we expect a finite number of terms from this Taylor series to probably give us a better estimate?
 - $x = 0$

- (b) $x = 3$
- (c) $x = 8$
- (d) There is no way to tell.

5. A Taylor series for a function $f(x)$ at $a = 10$ has a radius of convergence of 3. If we use the first 10 terms of this series to estimate $f(15)$ we will probably get

- (a) an infinite result.
- (b) a result which is closer to the real value of $f(15)$ than if we used 5 terms.
- (c) a result which is farther from the real value of $f(15)$ than if we used 25 terms.
- (d) a result which is closer to the real value of $f(15)$ than if we used 15 terms.
- (e) More than one of the above are true.

6. We are given a Taylor series for a function $g(x)$ at $a = -5$, with a radius of convergence of 6. Which would give the best estimate of $g(-5)$?

- (a) The first term of the Taylor series.
- (b) The first 5 terms of the Taylor series.
- (c) The first 10 terms of the Taylor series.
- (d) The first 100 terms of the Taylor series.
- (e) All would give the same result.