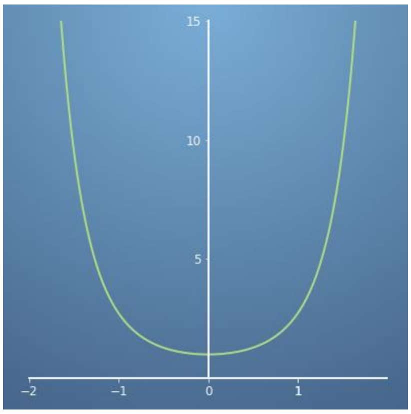
Applying the Taylor series

TOTAL POINTS 5

1.Question 1

In the two previous videos, we have shown the short mathematical proofs for the Taylor series, and for special cases when the starting point is x=0, the Maclaurin series. In these set of questions, we will begin to work on applying the Taylor and Maclaurin series formula to obtain approximations of functions.

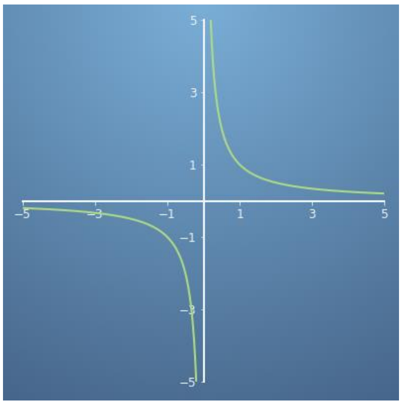


For the function f(x) = e^{x^2} about x=0, using the the Maclaurin series formula, obtain an approximation up to the first three non zero terms.

1 / 1 point

- ○ f(x) = 1 + 2x + x^2 / 2 + ……
- ○ f(x) = 1 - x^2 - x^4 / 2 ……
- ○ f(x) = x^2 + x^4 / 2 + x^6 / 6 + …….
- ◉ f(x) = 1 + x^2 + x^4 / 2 + …..

2.Question 2

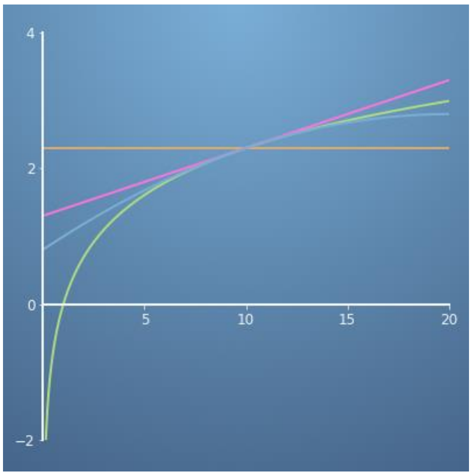


Use the Taylor series formula to approximate the first three terms of the function f(x) = 1/x, expanded around the point *p* = 4.

1 / 1 point

- [ ] f(x) = (x-4) / 16 + (x-4)^2 / 64 - (x-4)^3 / 256 …….
- [ ] f(x) = - 1 / 4 - (x+4) / 16 - (x+4)^2 / 64…..
- [ ] f(x) = 1 / 4 - (x+4) / 16 + (x+4)^2 / 64 + …..
- [x] f(x) = 1 / 4 - (x-4) / 16 + (x-4)^2 / 64 + ….

3.Question 3



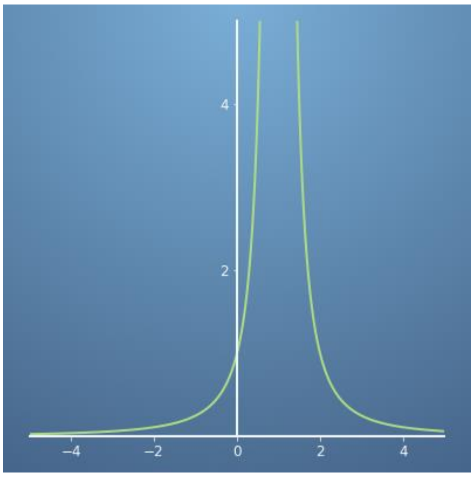
By finding the first three terms of the Taylor series shown above for the function $f(x)=\ln(x)$ (green line) about $x=10$, determine the magnitude of the difference of using the second order taylor expansion against the first order Taylor expansion when approximating to find the value of $f(2)$.

1 / 1 point

- [ ] $\Delta f(2)=0.5$
- [x] $\Delta f(2)=0.32$
- [ ] $\Delta f(2)=1.0$
- [ ] $\Delta f(2)=0$

4.Question 4

In some cases, a Taylor series can be expressed in a general equation that allows us to find a particular n_{th} term of our series. For example the function f(x) = e^x has the general equation $f(x)=\sum_{n=0}^{\infty} x^n/n!$. Therefore if we want to find the 3_{rd} term in our Taylor series, subsitituting $n=2$ into the general equation gives us the term x^2 / 2. We know the Taylor series of the function e^x is f(x) = 1 + x + x^2 / 2 + x^3 / 3! + …. Now let us try a further working example of using general equations with Taylor series.

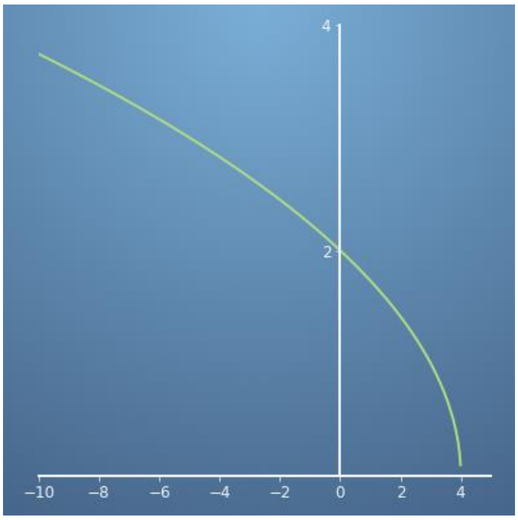


By evaluating the function f(x) = 1 / (1-x)^2 about the origin x=0, determine which general equation for the n_{th} order term correctly represents $f(x)$.

1 / 1 point

- ○ $f(x)=\sum_{n=0}^{\infty}(1+n)(-x)$^(n)
- ○ $f(x)=\sum_{n=0}^{\infty}(2+n)(x)$^(n)
- ○ $f(x)=\sum_{n=0}^{\infty}(1+2n)(x)$^(n)
- ◉ $f(x)=\sum_{n=0}^{\infty}(1+n)x$^(n)

5.Question 5



By evaluating the function f(x) = \sqrt{4-x}$f(x)=4-x$ at x = 0$x=0$, find the quadratic equation that approximates this function.

1 / 1 point

- ○ f(x) = 2 - x - \frac{x^3}{64} \ldots$f(x)=2-x-_{64}x_3\ldots$
- ○ f(x) = \frac{x}{4} - \frac{x^2}{64} \ldots$f(x)=_{4}x-_{64}x_2\ldots$
- ○ f(x) = 2 + x + x^2 \ldots$f(x)=2+x+x_2\ldots$
- ○ f(x) = 2 - \frac{x}{4} - \frac{x^2}{64} \ldots$f(x)=2-_{4}x-_{64}x_2\ldots$