Power series of functions pdf

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To begin with, we already know how to do it, although when we first came across this series, we didn't think of it as a power series or recognized that it was a function. Recall that the geometric series is the sum of the limits_n 0infty (a'r'n) 5in'mbox provided that the left r (right) zlt; 1Do not forget also that if (left) r (right) the series diverges. Now, if we take (a-a-a-a-1) and (r-x) it becomes, start equationlimits_ n 0 x'n Frak{1}1 - x'hspace 0.5in mbox provided that left x right zltfty 1 markeq:eq1end equation Turning to this, we see that we can represent the function of start the equation f on the left (x right) frak{1}1 - x markeq:eq2'end-equation with a series of power (beginning) limits_ x'n (hspace) - 0.5 inches provided that the left x right zlt; 1 markeq:eq3end equation This provision is important. We can clearly connect any number other than x (x 1) to the feature, however, we will only get a converged power series if (left) x on the right qlt; 1). This means that equality in q (eqref'eq:eq1) will only be maintained if (left) x (right) q lt; 1). For any other value (x) equality will not hold. Note also that we can also use this to recognize that the convergence radius of this power series is (R 1) and the convergence interval is (left) x right zlt; 1). This idea of convergence is important here. We will present many features like the power series, and it will be important to recognize that submissions will often only be valid for a range (x) and that there may be values (x) that we can connect to a feature that we can't connect to the power series presentation. In this section, we'll focus on presenting features with a power series where features can be associated with a q (eqref'eq:eq2) function. So we we hope to familiarize ourselves with some of the kinds of manipulations that we sometimes have to do when working with the power of the series. So let's move on to a couple of examples. Example 1 Find a power series view for the next feature and determine its convergence interval. (left (x (right) - frak{1}1, x'3 Show the solution that we need to do here is to tie this feature back in ('eqref'eq:eq2). Recall that h in q (eqref'eq:eq2) is just a variable and can represent{1} anything. that and (x) in (eqref'eq:eq2). So all we have to do is replace (x) in (Ekrefek:eq3) and we have a power series presentation for (d)left (x (right). (left) limits_ (x (right) - (x'3) (right) qlt; that we've replaced in both the power series and the convergence interval. (left) (x (right) - sum limits_ 0 left (- 1) (right) x x (right) qlt; 1'hspace 0.25 inches) (Rightarrow 'hspace) 0.25 inches x on the right of the zlt; 1 So, in this case the convergence interval is the same as the original power series. That doesn't usually happen. Most often, the new convergence interval will be different from the original convergence interval. Example 2 Find a power series view for the next feature and determine its convergence interval. (right) - frachra2x'2'2'1, x'3 Show Solution This feature is similar to the previous feature. The difference in numbers and at first glance, which looks like an important difference. Since there is no eqref'eq:eq2) in the number, it seems that we cannot link this feature to this. However, now that we have worked the first example of this is actually very simple, since we can use the result of the response from this example. To see how to do this, let's first rewrite the feature a bit. (right) - 2 xx2, frak{1} 1 (x-3) Now, from the first example, we already have a power series for the second term, so let's use this to write a feature like, (right) - 2 x2 amount limits_ n - 0infty (left) hspace (0.5in'mbox) provided that the left x (right) qlt; 1 Note that the presence (x) outside of the series will not affect its convergence, and therefore the convergence interval remains the same. The last step is to bring the odds in the series and we will do. When we do Make sure and combine (x) in as well. Normally, we only want one (x) in the power series. On the left (x x limits_ on the right) As we've seen in the previous example, we can often use previous results to help us. This is an important idea to remember, as this can often greatly simplify our work. Example 3 Find a power series view for the next feature and determine its convergence interval. (right) - fracas'5 - x' Show Solution So, again, we have (x) in the numerate. So, as in the last example let's factor that in and see what we have left. (right{1}) If we had a power series presentation for g (right), frak{1}5, if we had a power series view for g (x right), then we could get a power series view (left (right). First we'll notice that in order to use q (eqref'eq:eq2) we'll need a number in the denominator to be one. (right) - frak{1}{5}, frak{1}1 - frax'{5}) Now all we have to do to get a glimpse of the power series is to replace (x) in (ekrefek:eq3) with {5} (frac'x). This gives, g left (x right) frak{1}{5}, amount limits_ n 0 infty left (frak x {5} (right) (frak) x {5} (right) qlt; 1 Now let's make a small simplification on the series. start alignment to the left (x limits_{1}{5} (right) Amount (amount) limits_ n 0'infty (fracas) - convergence interval for this series: (left) (frak) x {5} (right) 1'hspace'0.25in' (Right Space)0.25in'frac{1}{5} on the left x (right) qlt; 1'hspace'0.25in' (Right Space) x (right) q lt; 5 Ok, it was a job to present a power series for (g left) let's now find a power show for the original feature. what we need to do to do this is multiply the power series presentation for (g)left (x right) on (x) and we'll have it. (beginning) alignment to the left (limits_ x{1} (right) amount limits_ n 0 infty fracx'n y 15n y 1 end the interval of convergence does not change, So we hope that we now have an idea on how to find a power series presentation for some features. :eq2), but this is just the beginning. Now we need to look at some further power series manipulations that we will have to do from time to time. We need to discuss the differentiation and integration of power lines. Start by differentiating the power series, limits_ the left c_1 c_0 c_n (x right) (left) (x - a) c_2 c_3 (right) we know that if we differentiate the finite amount of terms all we need to do is differentiate each of the terms and then add them back up. With endless amounts there are some subtleties that we have to be careful of, but somewhat beyond the course. Well enough for us, however, it is known that if the power series presentation (left (right) has a radius of convergence (R qgt;0), then the term term power series differentiation will also have a radius of convergence (R) and (more importantly) there will actually be a presentation of the power series (f'left) provided that we stay within a radius. Then we may or may not be able to differentiate each term of the series to get a derivative from the series. So what all this means to us is that, On the left (x c_2 c_1 c_n right limits_)) 3 c_3 (x - a) (c_n limits_right) It has been changed from th (n y 0) to y (n y 1). This is an acknowledgement of the fact that the derivative of the first term is zero and therefore is not in the derivative. Note, however, that since the n'0 term of the above series is also zero, we could start the series at n 0 if it was necessary for a specific problem. Overall, however, this will not be done in this class. Now we can find formulas for higher order derivatives, and now. (beginning) alignment (left) (left) (x limits_ (right limits_ c_n) znifti (n - 1) (right) left (n - 2) (right) (c_n) (x - a' right) - 3, etc. Let's talk briefly about integration. Just as with differentiation, when we have endless series we have to be wary of just the term integration by term. to get the integral of the series itself. In other words, the beginning is aligned to the left (x right), dx, x sum limits_ n 0 infty c_n on the left (x - a (right limits_) (left) c_n (x - a limits_) (c_n right) frac-left (x- a) (right) , 1'n 1'n, (end) Please note that we are picking the integration constant, (C) that is outside the series here. Let's sum up the differentiation and integration of ideas before we go to the example or two. Fact If u (left x (right) - the amount of limits_ 0infty (c_n) on the left (x - a)) has a radius of rapprochement (R zgt; 0), then, Left (x right) limits_ (x c_n - right) , dx' - C - amount (amount) limits_ n - 0'infty (c_n) frak (x - a) out (R). (right) - frak{1} on the left (1 - x x x) , Show solution to the problem, Note that (frac{1} (left) Left (frak{1}1 - x right) Then, since we have a power series view for frac{1}1 - x1, all we need to do is differentiate this power series to get a power series view (g left). (beginning) alignment to the left ({1} x{1} (right) Left (amount limits_)n - 0infty (x'n) - (right) and then limits_, since the original power series had a convergence radius, and therefore g/x will also have a convergence radius q(R y 1gen). (right) - (right) - (5 - x) - Show solution In this case we should notice{1} that - (left) and then remember that we have a power series presentation for frac{1} 5 - x Remember that we found a view for this in Example 3. So, start alignment (left limits_{1} (5 - x) In 1.,dx' - C - sum limits_ n 0infty (frak)x'n, 1 1 (left) (C), connecting value in th(x). (beginning) aligns (left (5 - 0) (right) - C - sum limits_n 0 in foot (frac) So, the final answer: Left (5 - x) (right limits_) n - 1 left (n - 1) (right) - 5n, 1 Note that it is normal to have a permanent seat outside of a series like this. In fact, there's no way to bring it into the series, so don't get excited about it. Finally, since the Model 3 power series had a convergence radius (R-5), this series will also have a convergence radius (R-5). (R-5). power series of functions pdf. representation of functions as power series. power series representation of functions calculator. power series of trigonometric functions. power series expansion of trigonometric functions. power series of common functions. power series expansion of analytic functions. table of power series for elementary functions