University of the People

MATH 1211 Calculus 1

Unit 2 Written Assignment

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1.   Find the limit: **[ \displaystyle \lim_{x \to 0} (1+x)^{ \frac{1}{x} } ](https://my.uopeople.edu/filter/tex/displaytex.php?texexp=%20%5Cdisplaystyle%20%5Clim_%7Bx%20%5Cto%200%7D%20%281%2Bx%29%5E%7B%20%5Cfrac%7B1%7D%7Bx%7D%20%7D%20)**

According to (1.5 Exponential and Logarithmic Functions - Calculus Volume 1 | OpenStax, n.d.), when a function in this form of

(1+ )m as m -> ∞ , then we refer the compound interest function that the

Limit is close to the natural number of e.

If we replace m = 1/m

Then we get (1+m)ˆ1/m as m -> 0. The result is same as the compound formula which is e≈2.718282.

2.    Find the limit: **[ \displaystyle \lim_ {\theta\to 0} { \frac{sin 2 \theta }{ \theta } } ](https://my.uopeople.edu/filter/tex/displaytex.php?texexp=%20%5Cdisplaystyle%20%5Clim_%20%7B%5Ctheta%5Cto%200%7D%20%7B%20%5Cfrac%7Bsin%202%20%5Ctheta%20%7D%7B%20%5Ctheta%20%7D%20%7D%20)**

sin(2θ)=2sinθcosθ

so f(x) = 2sinθcosθ/θ

According to the (2.3 The Limit Laws - Calculus Volume 1 | OpenStax, n.d.),

using



= limit sin \* limit 2\*cos

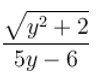
As limit sin =1 , limit 2 \* cos

Thus the result = 1 \*1 \*2 =2

3.    Find the limit: **[ \displaystyle \lim_{y \to \infty } { \frac{ \sqrt{y^2+2} }{5y-6} } ](https://my.uopeople.edu/filter/tex/displaytex.php?texexp=%20%5Cdisplaystyle%20%5Clim_%7By%20%5Cto%20%5Cinfty%20%7D%20%7B%20%5Cfrac%7B%20%5Csqrt%7By%5E2%2B2%7D%20%7D%7B5y-6%7D%20%7D%20)**

Apply the quotient law, 5y -6 ≠0, y ≠ 6/5.

The function is continuous over the domain { y ≠ 6/5 }

Let f(y)=  , let the function divicde by higest demonimator,

Then

Then we get nominator =

Denominator = 5-6/y

As y approaches ∞, 2/y^2 -> 0 , 6/y->0

So the formula can be simplified into / 5-0 =

4.    Find the limit: **[ \displaystyle \lim_{x \to 0} { \frac{x-2}{|x|-2 } } ](https://my.uopeople.edu/filter/tex/displaytex.php?texexp=%20%5Cdisplaystyle%20%5Clim_%7Bx%20%5Cto%200%7D%20%7B%20%5Cfrac%7Bx-2%7D%7B%7Cx%7C-2%20%7D%20%7D%20)**

Apply the quotient law of limit limit = limit g(x)/ limit f(x)

Limit x-2 as x->0 = -2

Limit |x|-2 as x->0 =-2 and the x ≠+2

So the limit is -2/-2=1.

5.    Find the value of k that would make the limit exist. **[  \displaystyle \lim_{x \to 2} f(x) = \frac{x^2+kx-10}{x-2}  ](https://my.uopeople.edu/filter/tex/displaytex.php?texexp=%20%20%5Cdisplaystyle%20%5Clim_%7Bx%20%5Cto%202%7D%20f%28x%29%20%3D%20%5Cfrac%7Bx%5E2%2Bkx-10%7D%7Bx-2%7D%20%20)**

To make the limit exisit, to make the nominator can be factor to (x-2),

Then we assume one of solution is x=2, then 10 = 2\*5

So nominator can be (x-2)(x+5) = x^2+5x-2x-10= x^2+3x-10 , so k can = 3

Then (x-2)(x+5)/(x-2) = x+5 when x ≠ 2. The limit = 2+5 =7 when k =3.

6.    Find the intervals on which the function is continuous, **[ f(x)=\frac{x+4}{x^2-12x+32} ](https://my.uopeople.edu/filter/tex/displaytex.php?texexp=%20f%28x%29%3D%5Cfrac%7Bx%2B4%7D%7Bx%5E2-12x%2B32%7D%20)**

The function can be rewrite in to , according to the (*2.4 Continuity - Calculus Volume 1 | OpenStax*, n.d.), rational and polynomial function are continuous over their domain. So the domain is x ≠ 4 and x ≠ 8

The domain (-∞,4)U(4,8)U(8, ∞)

7.     Find the intervals on which the function is continuous,  **[ f(x)= \frac{4}{(x+3)^2+6} ](https://my.uopeople.edu/filter/tex/displaytex.php?texexp=%20f%28x%29%3D%20%5Cfrac%7B4%7D%7B%28x%2B3%29%5E2%2B6%7D%20)**

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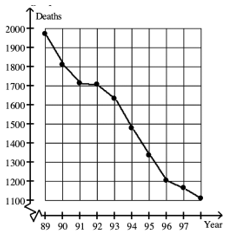
(-∞ , ∞)

8. Find the intervals on which the function is continuous, **[ f(x)= \sqrt{6x+3} ](https://my.uopeople.edu/filter/tex/displaytex.php?texexp=%20f%28x%29%3D%20%5Csqrt%7B6x%2B3%7D%20)**. Identify the type of discontinuity.

6x+3 need >=0 thus x >=-3/6 =1/2. The [-1/2, ∞} is the domain f(x) is continuous.

Limit from left do not exist as x<-3/6 is not defined, limit from right is exisit and = f(x). This should be the removable discontinuity as f(x)= limitf(x) as x-> -1/2 and limit of f(x) is real number.

9. The graph below shows the number of tuberculosis deaths in the United States from 1989 to 1998.  Estimate the average rate of change in tuberculosis deaths from 1991 to 1996.



The the graph be a function of f(x) = death over 1989 to 1998

Then f(1991)=1700 ,f(1996)=1200

Delta = 1200-1700/ 1996-1991= - 500/5= -100

The average change of rate is -100/year.

Reference

*1.5 Exponential and Logarithmic Functions - Calculus Volume 1 | OpenStax*. (n.d.). Retrieved September 5, 2022, from https://openstax.org/books/calculus-volume-1/pages/1-5-exponential-and-logarithmic-functions

*2.3 The Limit Laws - Calculus Volume 1 | OpenStax*. (n.d.). Retrieved September 11, 2022, from https://openstax.org/books/calculus-volume-1/pages/2-3-the-limit-laws

*2.4 Continuity - Calculus Volume 1 | OpenStax*. (n.d.). Retrieved September 13, 2022, from https://openstax.org/books/calculus-volume-1/pages/2-4-continuity