Course	Thing	Explanation	Date	Important	Index
MA1521	Precise Definition of limit	$\forall \varepsilon>0,\ \exists \delta\varepsilon>0$ st $\lvert f(x)-L\rvert<\varepsilon$ whenever $0<\lvert x-a\rvert<\delta\varepsilon$	18/08/2021	Important	43
MA1521	Composite limit	$\lim_{x\to a} f(g(x)) = f(\lim_{x\to a} g(x))$.	18/08/2021		44
MA1521	Continuous functions	A function is continuous on an interval if it is continuous at every number in the interval.	18/08/2021		45
MA1521	Limit laws	Preserved under addition, multiplication, division, exponentiation	18/08/2021		46
MA1521	Prove continuous	$\lim_{h\to 0} f(x+h) = f(x)$	25/08/2021		86
MA1521	Prove differentiable	$\lim_{h\to 0} (f(x+h)-f(x))/h$	25/08/2021		87
MA1521	Extreme Value Theorem	If f continuous in interval, then it contains an absolute max and min value; so there are numbers in the interval and the function is between the max and min for every other in the interval	27/08/2021	Important	99
MA1521	First Derivative Theorem	f'(x) = 0 at the max or min value	27/08/2021		100
MA1521	Rolle's theorem	If f continuous and differentiable and $f(a) = f(b)$, then $\exists c$ such that $f^{-1}(c) = 0$	01/09/2021	Important	135
MA1521	Mean Value Theorem	If f continuous and differentiable, then $\exists c\ f^{-1}(c) = (f(b)-f(a))/(b-a)$	01/09/2021	Important	136
MA1521	Cauchy Mean Value Theorem	if f and g continuous and differentiable, then $\exists c\ f^{-1}(c)/g(c) = (f(b)-f(a))/(g(b)-g(a))$	01/09/2021		137
MA1521	Riemann Sum	$\sum f(c)$(size of interval)	03/09/2021		141
MA1521	Limit comparison test	Instead of comparing by inequality, you can take the quotient of the two limits to be tested; If the new limit is not zero or ∞, then the two smaller limits are both convergent or both divergent; $\lim \sum f(x) = \lim(f(x) / g(x)) \Rightarrow$ if zero or ∞, then nature of $f(x)$ is the nature of g(x)	06/10/2021		262
MA1521	Comparison test	$\lim \sum f(x) \Rightarrow$ compare the size of $f(x)$ vs g(x) ⇒ can corrale the $f(x)$ using the nature of g(x)	06/10/2021		263
MA1521	Absolute convergence	$\sum \lvert f(x)\rvert \Rightarrow \sum f(x)$	06/10/2021		264
MA1521	Conditionally convergent	lim of odd terms = lim of even terms = lim	06/10/2021		266
MA1521	Monotonic sequence theorem	If the terms > 0 and have upper bound, then limit is the upper bound; If the terms < 0 and have lower bound, then limit is lower bound	06/10/2021		267
MA1521	Integral test	$\sum f(x) \approx \int f(x)dx \Rightarrow$ the integral to ∞ will decide whether the sum is convergent or divergent	06/10/2021		268
MA1521	Ratio test	$\lim\lvert a_{n+1}/a_n\rvert = L$; $\lvert L\rvert < 1 \Rightarrow$ absolutely convergent; $L > 1$ or infinite ⇒ divergent; $L = 1 \Rightarrow$ inconclusive	06/10/2021		269
MA1521	Root test	$\lim(\sqrt[n]{a_n}) = L$; $\lvert L\rvert < 1 \Rightarrow$ absolutely convergent; $L > 1$ or infinite ⇒ divergent; $L = 1 \Rightarrow$ inconclusive	06/10/2021		270
MA1521	Power series	$\sum c_n(x - a)^k$ is a representation about the center a; Radius of convergence = $R = \lim\lvert c_n/c_{n+1}\rvert = \lim\lvert a/c_n\text{^}(1/n)\rvert$; $\lvert x - a\rvert < R \Rightarrow$ convergent; Can differentiate the power series	08/10/2021	Important	310
MA1521	Radius of convergence	Radius of convergence is the reciprocal of the limits gotten through Ratio and Root test	08/10/2021	Important	311
MA1521	Open/closed region	Closed region contains all boundary points; Open region contains only interior points	08/10/2021		312
MA1521	Derivative of inverse function	$f^{-1}(x)' = 1 / f'(f^{-1}(x))$	09/10/2021	Important	331
MA1521	Trigo identities	$\sec^2x = 1 + \tan^2x$; $\csc^2x = 1 + \cot^2x$; $\cos2x = 2\cos^2x - 1 = 1 - 2\sin^2x$; sinAcosB = ½[sin(A-B)+sin(A+B)]; sinAsinB = ½[cos(A-B)-cos(A+B)]; cosAcosB = ½[cos(A-B)+cos(A+B)]; (tanx)' = $\sec^2x$; (cotx)' = $-\csc^2x$; (secx)' = tanxsecx; (cscx)' = -cotxcscx; $(\sin^{-1}x)' = 1/\sqrt{(1-x^2)}$; $(\cos^{-1}x)' = -1/\sqrt{(1-x^2)}$; $(\tan^{-1}x)' = 1/(1+x^2)$; $(\cot^{-1}x)' = -1/(1+x^2)$; $(\sec^{-1}x)' = 1/(\lvert x\rvert\sqrt{(x^2-1)})$; $(\csc^{-1}x)' = -1/(\lvert x\rvert\sqrt{(x^2-1)})$; $\int 1/(x^2+d^2)dx = \tan^{-1}(x/d)/d$; $\int \csc(x)dx = -\ln(\csc(x) + \cot(x))$; $\int \cot(x)dx = \ln(\sin(x))$; $\int \sec(x)dx = \ln(\sec(x) + \tan(x))$; $\int 1/(a^2-x^2)dx = \ln(a+x/a-x)/2a$; $\int 1/\sqrt{(a^2-x^2)}dx = \sin^{-1}(x/a)$; $\int 1/\sqrt{(x^2 \pm a^2)}dx = \ln(x + \sqrt{(x^2 \pm a^2)})$;	09/10/2021	Important	332
MA1521	Mean Value Theorem for Definite Integr	$\exists c$ s.t. $f(c) = \int f(x)dx$ / (b-a); There is a value $f(c)$ that equals to the average y of the integral	12/10/2021	Important	335