Midter	m 2
(a) Given	F.R → R. LER, f(x) converges to L. as x → - n if
Q<3A	, AMER. YX=M, If(x)-L/ <e< th=""></e<>
70 %	
For all	€>0, ∃M= = E ER s.t.
AX > W	() Hx - 0) = Hx < x < M = {
∃ W. =	- I ER s.t.
	1, 1 Hx - 0 = Hx < x = M = .
By def.	intion, 1 1 - 1 1 - 1 1 1 1 1 1 1 1 1 1 1 1 1
,	11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	Misself with I so District the treatment
(b) g is con	timons at 0 iff \2>0, 35>0.
	y∈R, y < 5, g(y)-g(0) < €
A 5 > 0	1 1 My 1 M2
Jy∈R	$= \frac{1}{5} = \max\{M_1, -M_2\}$
1 y = (0, 19(4)-9(0)=0< 8
2 0<	yくる => サフラッMi
- 19(y)-g(0) = f(+)-L < {
3-5<	y<0=>-5>-5>-M2=> + <m2< th=""></m2<>
13(1	y)-9(0)= f(+)-L <{
Therete	re, g is continuous ort O.
TRA	

(c)	f is continuous at 0
1111111	=> \delta \q
	YXER, 1x1<5, 1f(x)-f(0)/<2
	50 7 M= 5 CR, YyzM= 3,
	4<8⇒ 4 <8 ⇒ 4(4)-f(0) <€
	=> g(y)-f(o) < 2
	7 M2=-3 ER, Yy=M2=-8
	0>=> 1= 1= 1= 1= 1= 1= 1= 1= 1= 1= 1= 1= 1=
	$= 2 g(y) - f(0) < \epsilon$
	Bu definition
	Li () Li () MA)
	$\lim_{y\to\infty} g(y) = \lim_{y\to-\infty} g(y) = f(0)$
	The transmission of the Announce of the second
	and the material of the Control
	(d.o) 5 / 1 / 4
	The same of the sa
	1 / 2 / S (CX) A Like the delivery to the second to
1	the second property of the second sec
1 1	The I start will be a start of the start of
1	Total Subsect of INSTITUTE TO SECURITION AS A SECURITION OF THE SE
	The state of the s

2.(a)	For [a,b],
	in [a,b] is bounded since 05 Xh &b yn
011 51	By Bolzano-Weierstrass thin, there exists a comergent
€ (/m).5.4.	subsequence (Xn;) st. lim Xn; = limsup Xn
	Since Mni E[a,b], = inf (an: neN) an= sup(No. len)
	= = sup (76. n>1)
	1 x x 1 1 = 1 x 4 = 1 x 6 = 1
	lim Mni & [a,b] - (-)1-1 = 2 - 1-1
	50 [a.b] is requestially compact
	N 1 street 13 to 1 street 1 st
	For (a, b),
	let $x_n = b - \frac{b-a}{2^n}$
	every subsequence (Xnx) converges to b since
	Y ≤ > 0, ∃M=[10, (\(\frac{b-a}{\xi})] ∈ N st. \(\frac{b}{\xi} \text{M}, \ \chi_n - b\ < \xi
	But b & (a,b)
	50 (a,b) is not sequentially compact
	The state of the s
(P)	Supposo K is not bounded, then 3 (X1) CK st. Xn2n
	Since K is conventially connect.
	Since K is sequentially compact, then 3 (Xnx) st. lim Xnx = X where x CK
	But for all nk > x, xnk & nk > x => contradiction
	Therefore, K is bounded.
	γ γ γραιιμέτει.

(c)	If K is sequentially compact, by (b) it is bounded.
	Since Q is dense in R
	7 Mist. supk-1 < Ni < supk
	3 X2 s.t. Sup K- \(\in \times
	+ dexis+(x11 = 1)
	3 ×n st. sup K-h < ×n < sup K
	Since Xn compk for all h, Xn EK. (Xn) in K.
	By cor. of squeeze lomma, (Xn) converges to supk since
	Since K is sequentially compack, we super super- super-
	supkek, similarly infkek.
,	1/4 > 1/4 > 1/4 > 1/4 > 1/4 >
(g)	For any sequence { Yn} cf(K), { Yn} = {f(xn)} where {xn}ck
	Since K is sequentially compact, {xh} has a subsequence {xnk}
	Since K is sequentially compact, {Xh} has a subsequence {Xhk} s.t. lim Xhk = x for xeK.
	Then lim Ink = lim f(Xnk) = f(X)
	since $x \in K$, $f(x) \in f(K)$
	Therefore f(K) is sequentially compact.
	D
	By (c), supf(k) < f(k), inf f(k) < f(k),
	since YNEK f(x) = supf(K), f(x) = inff(K)
	Therefore - achieves an abs min and als max in K.
	THE CONTRACTOR STATE OF THE STA

3. (A)	By Taylor Theorem, given X, x+h ER,
	Ic strictly between X and X+h such that
	f(x+h)=P^(x+h)+ f"(c) (x+h-x)
	4(VIN) - 11(VII)
	$= f(x) + f'(x) + \frac{f''(c)}{2} + \frac{f'''(c)}{2} + \frac{f''(c)}{2} + \frac$
	$f(x+p) - f(x) - f'(x) = \frac{5}{f''(c)}$
	Late of the Date of the transfer of the Day Company
No travel	In [N, N+h], & has continuous derivative =) f" bounded
	$\Rightarrow m_1 \leq f''(c) \leq m_2$
	Let $M_1 = \frac{m_1}{2}$, $M_2 = \frac{m_2}{2}$
	=> Mih = froh = Mih
	we fixed the fast of the state commission of the
(9)	By Taylor Theorem;
	3(, E(x, x+h), C=G(x-h, x) st.
	$f(x+h) = f(x) + f'(x)h + f''(x)h^2 + f''(x)h^3$
	of the day to be a superior to a large of the superior to the
	$f(x-h)=f(x)-f'(x)h+f''(x) _{2}^{2}-f^{(3)}(c_{2}) _{3}^{3}$
	The state of the s
	$f(x+h)-f(x-h)-f'(x)=f'(x)=f'(x)(c_1)+f'(x)(c_2)/2$
	1. C. 2h (21 home 6 14 12 11 12 11 1 1 1 1 1 1 1 1 1 1 1 1
	In [M, M+h] and [M-h, M],
	f has 3 continuous derivative => f(3) bounded
	=> $m_1 \in f^{(3)}(C_1) \leq m_2$, $m_3 \in f^{(3)}(C_2) \leq m_3$ Let $M_3 = \frac{m_1 + m_2}{12}$, $M_4 = \frac{m_2 + m_4}{12}$ =>
	LEC 1V13 - 12', 1V14 = -12' =)
Carlotte Contract	

(c)	$f(n) = \sin(kn)$
and the state of	$f'(n) = k \cos(kn)$
	$f''(x) = -k^2 \sin(kx)$
ALL DESCRIPTION OF THE PROPERTY OF THE PROPERT	$f^{(3)}(x) = -k^3 \cos(kx)$
2. 外土物	By part (a),
(4.	$\left \frac{f(x+h)-f(x)}{h}-\frac{f(x)}{h}\right =\left \frac{f''(c)}{2}h\right $
1 ba	$= \frac{ k^2 \sin(kx)h }{2} = \frac{ k^2 h }{2} \frac{ \sin(kx) }{2} < \frac{ k^2 h }{2}$
	By part (b), k20? [10]
	1 f(x+h) - f(x-h) - f'(xx) = f(3)(c1) + f(3)(c2) 2
	2h - 12 h
	$=\frac{h^2}{12}\left -\frac{13}{12}\left(C_1N\right)-\frac{13}{12}\cos(C_2N)\right $
	$\frac{k^3h^2}{12}\left(\left \cos(c_1x_0)\right +\left \cos(c_2x_0)\right \right)$
	$\leq k^3 h^2 (+1) = k^3 h^2$
H-result of the second	12 1 (2) 1 (2) (1) (2) (3) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4
	A TOTAL OF THE PARTY OF THE PAR
	Many Cat= 1000000=10001000000000000000000000000
600	1000 C) 5 (4) 21+1= + (1-200) +1 -20 -[20-1,1] of
100h	
	GS+(3d)=+10-3d+-0=1 (3+10)=0
A CONTRACTOR OF THE CONTRACTOR	

```
4 (a) mi = inf < f(x); xe[fi-1, fi]}
     Mi=sup (f(x): xe[fi-1, fi])
     L(P, 1) = = mi ari
     U(P, f)= & Miaxi
    => mi = f(Ci) = Mi for i=1,...n => mi a xi = f(Ci) axi = Miaxi
    (b) Since f is Riemann integrable, Saf = Inf =
                                        = sup{L(P,f)}=inf(U(P,f))
    so 3 partition Pr of [a,b] st. Sof-E<L(P.f)< Sof
    Let P= P, UPz so it is a par
                             (P2,f)>(/P,f)
       [ ]- ε < L(P, f) < V(P, f) < [ ]+ ε
    For any bagging 7,
=> \int f - \( < \L(P, f) < \frac{5}{2} f(C;) \D(N; \( \U(P, f) < \int f + \( \)
    => | [of - \(\int\) \(\alpha\) | < \(\int\)
(c) For [0,1], Ni = 0+(1-0)- = = = Q YNEN
    For [1, 1+12], Ni= |+ (1+15-1)- = |+12(+) & Q since 15dQ
                                                     (H)CQ
    For [0, 1+2], xi=0+(1+2-0)==(1+2)=dQ
```

	$R_n(f, [0, 1]) = \sum_{i=1}^{n} f(x_i) \Delta x_i = \sum_{i=1}^{n} \left \frac{1}{n} = 1 \rightarrow 1 \text{ as } n \rightarrow \infty \right $
	Rn(f, [1, 1+,5])====================================
	Rn(f,[0, 1+15])===100(ix)+15===00 as n=0
	so all of them converges.
	lin (Rn (f, [0,1]) + Rn (f, [1, H-12])) = lim (1+0)
	= +0=
	fin Rn (f, [0, 1+12])=0
	so they are not equal.
· (9)	Not true.
	For {Rn(f, [0,1])} in (c) where f: [0,1] → R
	$f(x) := \begin{cases} 1 & x \in Q \\ 0 & x \notin Q \end{cases}$
	10 x4Q
	For any partition P, mi = inf {f(x): xi-1 < X < xi} = 0
	$M_{\lambda} = \sup_{x \in X_{\lambda}} \{f(x) : x_{\lambda-1} \leq X \leq X_{\lambda}\} = 0$
Marie Control	So $L(P,f) = \sum_{i=1}^{n} m_i \Delta N_i = \sum_{i=1}^{n} 0 \Delta N_i = 0$
	$U(P,f) = \frac{\pi}{2} M_i \Delta x_i = \frac{\pi}{2} \Delta x_i ^2$
	$\int_{0}^{\infty} f(x) dx = 0$
	$T_{\alpha}^{\alpha} f(x) dx = 1 + L_{\alpha}^{\beta} f(x) dx$
-	50 f is not Riemann integrable
	V