



(الرياضيات البحتة)
الصف الثاني الثانوي

الترم الثاني - الدرس الاول

المتابعات

(شرح)



المتابعة المنتهية والمتابعة غير المنتهية:

المتابعة المنتهية: هي متابعة عدد حدودها منته أي لها عدد محدود من العناصر.

المتابعة غير منتهية: هي متابعة عدد حدودها غير منته أي لها عدد لا نهائي من العناصر.

المُحتَوَّى



مثال ١

بين اي المتتابعات الآتية منتهية وغير منتهية:

(1) $(2, 5, 8, 11, \dots, 32)$

(2) $(\frac{1}{2}, 1, 2, 4, \dots)$

(3) $(ح_n) \text{ حيث } ح_n = 2^n - 3, n \in \mathbb{N}^+$

(4) $(ح_n) \text{ حيث } ح_n = \frac{(1-n)^n}{n^2}, n \in \mathbb{N}^+$

الحل

المُحتَوكة



الحد العام للمتابعة:

يرمز للحد العام للمتابعة بالرمز **ح_n** ويسمى احياناً بالحد النوني حيث **ح_n** هو صورة العنصر الذي ترتيبه **ن** في المتتابعة ويمكن استنتاجه من خلال بعض الحدود المعطاة من المتتابعة وذلك بادراك العلاقة بين قيمة الحد **ح_n** ورتبة الحد **ن**

المُحتَوَك



مثال ٢

اكتب الحد العام لكل من المتتابعات الآتية:

$$(1) \left(\dots, \frac{1}{16}, \frac{1}{8}, \frac{1}{4}, \frac{1}{2} \right)$$

$$(2) \left(\dots, 8, 6, 4, 2 \right)$$

$$(3) \left(\dots, \frac{1}{6}, \frac{1}{5}, \frac{1}{4}, \frac{1}{3} \right)$$

الحل

المُحتَوَكَا



مثال ٣

اكتب الحدود الخمسة الاولى من المتتابعة $\{a_n\}$

$$(1) \quad a_1 = 1, a_2 = 5, a_3 = 17 \text{ حيث } n \geq 1 \text{ واكتب الحد العام للمتتابعة}$$

$$(2) \quad a_1 = 1, a_2 = 3, a_3 = 7, a_4 = 13, a_5 = 21, a_6 = 31, a_7 = 43, a_8 = 57, a_9 = 73, a_{10} = 91, a_{11} = 111, a_{12} = 133, a_{13} = 157, a_{14} = 183, a_{15} = 211, a_{16} = 241, a_{17} = 273, a_{18} = 307, a_{19} = 343, a_{20} = 381, a_{21} = 421, a_{22} = 463, a_{23} = 507, a_{24} = 553, a_{25} = 601, a_{26} = 651, a_{27} = 703, a_{28} = 757, a_{29} = 813, a_{30} = 871, a_{31} = 931, a_{32} = 993, a_{33} = 1057, a_{34} = 1123, a_{35} = 1191, a_{36} = 1261, a_{37} = 1333, a_{38} = 1407, a_{39} = 1483, a_{40} = 1561, a_{41} = 1641, a_{42} = 1723, a_{43} = 1807, a_{44} = 1893, a_{45} = 1981, a_{46} = 2071, a_{47} = 2163, a_{48} = 2257, a_{49} = 2353, a_{50} = 2451, a_{51} = 2551, a_{52} = 2653, a_{53} = 2757, a_{54} = 2863, a_{55} = 2971, a_{56} = 3081, a_{57} = 3193, a_{58} = 3307, a_{59} = 3423, a_{60} = 3541, a_{61} = 3661, a_{62} = 3783, a_{63} = 3907, a_{64} = 4033, a_{65} = 4161, a_{66} = 4291, a_{67} = 4423, a_{68} = 4557, a_{69} = 4693, a_{70} = 4831, a_{71} = 4971, a_{72} = 5113, a_{73} = 5257, a_{74} = 5403, a_{75} = 5551, a_{76} = 5701, a_{77} = 5853, a_{78} = 6007, a_{79} = 6163, a_{80} = 6321, a_{81} = 6481, a_{82} = 6643, a_{83} = 6807, a_{84} = 6973, a_{85} = 7141, a_{86} = 7311, a_{87} = 7483, a_{88} = 7657, a_{89} = 7833, a_{90} = 8011, a_{91} = 8191, a_{92} = 8373, a_{93} = 8557, a_{94} = 8743, a_{95} = 8931, a_{96} = 9121, a_{97} = 9313, a_{98} = 9507, a_{99} = 9703, a_{100} = 9901, a_{101} = 10101, a_{102} = 10303, a_{103} = 10507, a_{104} = 10713, a_{105} = 10921, a_{106} = 11131, a_{107} = 11343, a_{108} = 11557, a_{109} = 11773, a_{110} = 11991, a_{111} = 12211, a_{112} = 12433, a_{113} = 12657, a_{114} = 12883, a_{115} = 13111, a_{116} = 13341, a_{117} = 13573, a_{118} = 13807, a_{119} = 14043, a_{120} = 14281, a_{121} = 14521, a_{122} = 14763, a_{123} = 15007, a_{124} = 15253, a_{125} = 15501, a_{126} = 15751, a_{127} = 16003, a_{128} = 16257, a_{129} = 16513, a_{130} = 16771, a_{131} = 17031, a_{132} = 17293, a_{133} = 17557, a_{134} = 17823, a_{135} = 18091, a_{136} = 18361, a_{137} = 18633, a_{138} = 18907, a_{139} = 19183, a_{140} = 19461, a_{141} = 19741, a_{142} = 20023, a_{143} = 20307, a_{144} = 20593, a_{145} = 20881, a_{146} = 21171, a_{147} = 21463, a_{148} = 21757, a_{149} = 22053, a_{150} = 22351, a_{151} = 22651, a_{152} = 22953, a_{153} = 23257, a_{154} = 23563, a_{155} = 23871, a_{156} = 24181, a_{157} = 24493, a_{158} = 24807, a_{159} = 25123, a_{160} = 25441, a_{161} = 25761, a_{162} = 26083, a_{163} = 26407, a_{164} = 26733, a_{165} = 27061, a_{166} = 27391, a_{167} = 27723, a_{168} = 28057, a_{169} = 28393, a_{170} = 28731, a_{171} = 29071, a_{172} = 29413, a_{173} = 29757, a_{174} = 30103, a_{175} = 30451, a_{176} = 30801, a_{177} = 31153, a_{178} = 31507, a_{179} = 31863, a_{180} = 32221, a_{181} = 32581, a_{182} = 32943, a_{183} = 33307, a_{184} = 33673, a_{185} = 34041, a_{186} = 34411, a_{187} = 34783, a_{188} = 35157, a_{189} = 35533, a_{190} = 35911, a_{191} = 36291, a_{192} = 36673, a_{193} = 37057, a_{194} = 37443, a_{195} = 37831, a_{196} = 38221, a_{197} = 38613, a_{198} = 39007, a_{199} = 39403, a_{200} = 39801, a_{201} = 40201, a_{202} = 40603, a_{203} = 41007, a_{204} = 41413, a_{205} = 41821, a_{206} = 42231, a_{207} = 42643, a_{208} = 43057, a_{209} = 43473, a_{210} = 43891, a_{211} = 44311, a_{212} = 44733, a_{213} = 45157, a_{214} = 45583, a_{215} = 46011, a_{216} = 46441, a_{217} = 46873, a_{218} = 47307, a_{219} = 47743, a_{220} = 48181, a_{221} = 48621, a_{222} = 49063, a_{223} = 49507, a_{224} = 49953, a_{225} = 50401, a_{226} = 50851, a_{227} = 51303, a_{228} = 51757, a_{229} = 52213, a_{230} = 52671, a_{231} = 53131, a_{232} = 53593, a_{233} = 54057, a_{234} = 54523, a_{235} = 54991, a_{236} = 55461, a_{237} = 55933, a_{238} = 56407, a_{239} = 56883, a_{240} = 57361, a_{241} = 57841, a_{242} = 58323, a_{243} = 58807, a_{244} = 59293, a_{245} = 59781, a_{246} = 60271, a_{247} = 60763, a_{248} = 61257, a_{249} = 61753, a_{250} = 62251, a_{251} = 62751, a_{252} = 63253, a_{253} = 63757, a_{254} = 64263, a_{255} = 64771, a_{256} = 65281, a_{257} = 65793, a_{258} = 66307, a_{259} = 66823, a_{260} = 67341, a_{261} = 67861, a_{262} = 68383, a_{263} = 68907, a_{264} = 69433, a_{265} = 69961, a_{266} = 70491, a_{267} = 71023, a_{268} = 71557, a_{269} = 72093, a_{270} = 72631, a_{271} = 73171, a_{272} = 73713, a_{273} = 74257, a_{274} = 74803, a_{275} = 75351, a_{276} = 75901, a_{277} = 76453, a_{278} = 77007, a_{279} = 77563, a_{280} = 78121, a_{281} = 78681, a_{282} = 79243, a_{283} = 79807, a_{284} = 80373, a_{285} = 80941, a_{286} = 81511, a_{287} = 82083, a_{288} = 82657, a_{289} = 83233, a_{290} = 83811, a_{291} = 84391, a_{292} = 84973, a_{293} = 85557, a_{294} = 86143, a_{295} = 86731, a_{296} = 87321, a_{297} = 87913, a_{298} = 88507, a_{299} = 89103, a_{300} = 89701, a_{301} = 90301, a_{302} = 90903, a_{303} = 91507, a_{304} = 92113, a_{305} = 92721, a_{306} = 93331, a_{307} = 93943, a_{308} = 94557, a_{309} = 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a_{754} = 567763, a_{755} = 569271, a_{756} = 570781, a_{757} = 572293, a_{758} = 573807, a_{759} = 575323, a_{760} = 576841, a_{761} = 578361, a_{762} = 579883, a_{763} = 581407, a_{764} = 582933, a_{765} = 584461, a_{766} = 585991, a_{767} = 587523, a_{768} = 589057, a_{769} = 590593, a_{770} = 592131, a_{771} = 593671, a_{772} = 595213, a_{773} = 596757, a_{774} = 598303, a_{775} = 599851, a_{776} = 601401, a_{777} = 602953, a_{778} = 604507, a_{779} = 606063, a_{780} = 607621, a_{781} = 609181, a_{782} = 610743, a_{783} = 612307, a_{784} = 613873, a_{785} = 615441, a_{786} = 617011, a_{787} = 618583, a_{788} = 620157, a_{789} = 621733, a_{790} = 623311, a_{791} = 624891, a_{792} = 626473, a_{793} = 628057, a_{794} = 629643, a_{795} = 631231, a_{796} = 632821, a_{797} = 634413, a_{798} = 636007, a_{799} = 637603, a_{800} = 639201, a_{801} = 640801, a_{802} = 642403, a_{803} = 644007, a_{804} = 645613, a_{805} = 647221, a_{806} = 648831, a_{807} = 650443, a_{808} = 652057, a_{809} = 653673, a_{810} = 655291, a_{811} = 656911, a_{812} = 658533, a_{813} = 660157, a_{814} = 661783, a_{815} = 663411, a_{816} = 665041, a_{817} = 666673, a_{818} = 668307, a_{819} = 669943, a_{820} = 671581, a_{821} = 673221, a_{822} = 674863, a_{823} = 676507, a_{824} = 678153, a_{825} = 679801, a_{826} = 681451, a_{827} = 683103, a_{828} = 684757, a_{829} = 686413, a_{830} = 688071, a_{831} = 689731, a_{832} = 691393, a_{833} = 693057, a_{834} = 694723, a_{835} = 696391, a_{836} = 698061, a_{837} = 699733, a_{838} = 701407, a_{839} = 703083, a_{840} = 704761, a_{841} = 706441, a_{842} = 708123, a_{843} = 709807, a_{844} = 711493, a_{845} = 713181, a_{846} = 714871, a_{847} = 716563, a$$



المتابعة التزايدية – التناقصية – الثابتة

تعريف:
لكل $n \leq 1$

- تسمي المتابعه (u_n) **تزايدية** اذا كان $u_{n+1} < u_n$ أي: $u_{n+1} - u_n < 0$
- تسمي المتابعه (u_n) **تناقصية** اذا كان $u_{n+1} > u_n$ أي: $u_{n+1} - u_n > 0$
- تسمي المتابعه (u_n) **ثابتة** اذا كان $u_{n+1} = u_n$ أي: $u_{n+1} - u_n = 0$



مثال ٤

بين أي المتابعات (\mathcal{E}_n) الاتية تزايديه وايها تناقصيه وايها غير ذلك:

$$(1) \quad (\mathcal{E}_n) = (2 - \sqrt{n})$$

$$(2) \quad (\mathcal{E}_n) = \left(\frac{1}{1 + \sqrt{n}} \right)$$

$$(3) \quad (\mathcal{E}_n) = \left(2 + \frac{(1-n)}{\sqrt{n}} \right)$$

$$(4) \quad (\mathcal{E}_n) = (5)$$



حل — ٤





مثال ٥

أوجد الحد العام للمتتابعة (٩, ١٣, ١٧, ٢١,) ثم أوجد

(١) a_7, a_6, a_5 في المتتابعة

(٢) رتبة الحد الذي قيمته ٦٥ في المتتابعة

المُحتَوَى



حلّه



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