Limits and Continuity

AP Calculus BC · Vocabulary in context

Word	Example
change /tʃeɪndʒ/	Calculus studies **change**, such as how fast a car speeds up.
accumulation /əˌkjuːmjʊˈleɪʃn/	Integration measures **accumulation**: how much builds up over time.
limit /ˈlɪmɪt/	The terms of 1, ½, ¼, … get closer and closer to a **limit** of 0. 1, ½, ¼, … 0
at a single instant /ætə ˈsɪŋgl ˈɪnstənt/	A derivative gives the rate of change **at a single instant**.
average rate of change /ˈævrɪdʒ reɪt ɒv tʃeɪndʒ/	The **average rate of change** is the change in y divided by the change in x. y x
interval /ˈɪntəvl/	The **interval** from 2 to 5 includes every number between them. 2 5
instantaneous rate of change /ˌɪnstənˈteɪnɪəs reɪt ɒv tʃeɪndʒ/	The **instantaneous rate of change** is the rate at one exact moment.
approaches /əˈprəʊtʃɪz/	As x **approaches** 2, f(x) gets closer and closer to 7. x 2 f(x) 7
derivative /dɪˈrɪvətɪv/	Use the **derivative** to find the curve's slope at this point.
integral /ˈɪntɪgrəl/	Use an **integral** to find the area under a curve.
arbitrarily /ˌɑːbɪˈtrerɪli/	We can make f(x) **arbitrarily** close to 7 – as close as we like. f(x) 7
sufficiently /səˈfɪʃəntli/	When x is **sufficiently** close to 2, f(x) is within 0.01 of 7. x 2 f(x) 7 0.01

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behavior /bɪˈheɪvjə/	The limit describes the **behavior** of f(x) near x = 2. f(x) x = 2
graphically /ˈgræfɪkli/	To find the limit **graphically**, look at the graph near x = 2. x = 2
numerically /njuːˈmerɪkli/	To find the limit **numerically**, make a table of values near x = 2. x = 2
analytically /ˌænəˈlɪtɪkli/	To find the limit **analytically**, use algebra.
left-hand limit /left hænd ˈlɪmɪt/	The **left-hand limit** uses x values smaller than 2. 2 x
right-hand limit /raɪt hænd ˈlɪmɪt/	The **right-hand limit** uses x values bigger than 2. 2 x
one-sided limits /wʌn ˈsaɪdɪd ˈlɪmɪts/	The limit exists only if both **one-sided limits** are equal.
open circle /ˈəʊpən ˈsɜːkl/	An **open circle** on a graph means that point is not included.
hole /həʊl/	The graph has a **hole** at x = 2 because f(2) is undefined. x = 2 f(2)
closed circle /kləʊzd ˈsɜːkl/	A **closed circle** on a graph means that point is included.
jump /dʒʌmp/	At x = 0 the graph has a **jump** from 1 to 3. x = 0 1 3
unbounded /ʌnˈbaʊndɪd/	Near x = 0, $1/x^2$ is **unbounded**: it grows without limit. x = 0 $1/x^2$
oscillates /ˈɒsɪleɪts/	Near x = 0, sin(1/x) **oscillates** up and down forever. x = 0 sin(1/x)
scale /skeɪl/	Choose a good **scale** so you can see the graph near the point.

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table /'teɪbl/	Make a **table** of f(x) for x = 1.9, 1.99 and 1.999. x = 1.9、1.99　1.999　f(x)
limit theorems /'lɪmɪt 'θɪərəmz/	The **limit theorems** let you find the limit of a sum by adding the limits.
Composite /'kɒmpəzɪt/	**Composite** functions, like $\sin(x^2)$, put one function inside another. $\sin(x^2)$
direct substitution /daɪ'rekt ˌsʌbstɪ'tjuːʃn/	For a polynomial, use **direct substitution**: just put the number in.
indeterminate form /ˌɪndɪ'tɜːmɪnət fɔːm/	0/0 is an **indeterminate form**: it does not tell you the limit. 0/0
equivalent form /ɪ'kwɪvələnt fɔːm/	Rewrite the function in an **equivalent form** that gives the same values.
Factor and cancel /'fæktə ænd 'kænsl/	**Factor and cancel**: $(x^2-4)/(x-2)$ becomes x + 2. $(x^2-4)/(x-2)$　x + 2
rational function /'ræʃənl 'fʌŋkʃn/	A **rational function** is one polynomial divided by another.
conjugate /'kɒndʒuːgeɪt/	The **conjugate** of $2+\sqrt{3}$ is $2-\sqrt{3}$. $2+\sqrt{3}$　$2-\sqrt{3}$
radical /'rædɪkl/	A square root sign is called a **radical**.
dominant /'dɒmɪnənt/	For large x, the x^3 term is **dominant**: it is much bigger than the rest. x　x^3
squeeze theorem /skwiːz 'θɪərəm/	The **squeeze theorem** traps a function between two others with the same limit.

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discontinuous /dɪskən'tɪnjuːəs/	The function is **discontinuous** at x = 2: the graph breaks there. x = 2
Removable discontinuity /rɪ'muːvəbl dɪskɒntɪ'njuːɪti/	**Removable discontinuity** is a hole that one point could fill.
Jump discontinuity /dʒʌmp dɪskɒntɪ'njuːɪti/	**Jump discontinuity** happens when the graph jumps from one value to another.
Infinite discontinuity /'ɪnfɪnət dɪskɒntɪ'njuːɪti/	**Infinite discontinuity** happens when the graph goes up or down without limit.
vertical asymptote /'vɜːtɪkl 'æsɪmptəʊt/	The line x = 0 is a **vertical asymptote** of y = 1/x. x = 0　y = 1/x
continuous /kən'tɪnjuːəs/	The beta particles have a **continuous** range of energies. β
continuous on an interval /kən'tɪnjuːəs ɒn ən 'ɪntəvl/	A function is **continuous on an interval** if you can draw it there without lifting your pen.
exponential /ˌekspə'nenʃl/	2^x is an **exponential** function. 2^x
logarithmic /ˌlɒgə'rɪθmɪk/	ln x is a **logarithmic** function. ln x
trigonometric /ˌtrɪgənəʊ'metrɪk/	sin x and cos x are **trigonometric** functions. sin x　cos x
piecewise-defined function /'piːswaɪz dɪ'faɪnd 'fʌŋkʃn/	A **piecewise-defined function** uses different rules for different x values. x
parameter /pə'ræmɪtə/	In x = 2t and $y = t^2$, t is the **parameter**. x = 2t　$y = t^2$　t
infinite limits /'ɪnfɪnət 'lɪmɪts/	**Infinite limits** happen when f(x) grows without limit. f(x)

Word	Example
limits at infinity /ˈlɪmɪts æt ɪnˈfɪnɪti/	**Limits at infinity** describe f(x) as x becomes very large. x f(x)
end behavior /end bɪˈheɪvjə/	The **end behavior** shows what a graph does far to the left and right.
horizontal asymptote /ˌhɒrɪˈzɒntl ˈæsɪmptəʊt/	y = 2 is a **horizontal asymptote**: the graph gets close to it for large x. y = 2 x
degrees /dɪˈgriːz/	Compare the **degrees** of the top and bottom polynomials.
ratio of the leading coefficients /ˈreɪʃɪəʊ ɒvðə ˈliːdɪŋ ˌkəʊɪˈfɪʃənts/	If the degrees are equal, the limit is the **ratio of the leading coefficients**.
relative magnitudes /ˈrelətɪv ˈmægnɪtjuːdz/	For large x, the **relative magnitudes** are: logs grow slowest, then powers, then exponentials. x
Intermediate Value Theorem /ˌɪntəˈmiːdiət ˈvæljuː ˈθɪərəm/	The **Intermediate Value Theorem** says a continuous function takes every value between f(a) and f(b). f(a) f(b)
existence theorem /egˈzɪstəns ˈθɪərəm/	An **existence theorem** tells you a solution exists, but not where it is.

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