

Advanced Placement Calculus AB

2024-2025

Summer Assignment

Welcome to Calc AB!

1. Read through section 1 of this packet. It contains the material that you need to know and understand. It should look familiar and will be a valuable resource for you throughout the upcoming year. **You must know your unit circle in radians.** Put your graphing calculator in radians. We only work in radians in Calculus.
2. Create an account on www.khanacademy.org
3. Then go to www.khanacademy.org/join and enter the class code **KHPSBR92**. If your email address does not contain your first and last name, please send me an email identifying who you are.
4. You will be working on the Limits and Continuity Unit on Khan Academy. Please make sure you are signed in so that I can see your progress and give you credit. Carefully read the grading section below so you know what is required.

Grading for the Summer Assignment

- The grading for the Khan Academy assignments will be based on the 34 skills in the Limits and Continuity Unit.
- Each skill is worth 3 points. You will earn:
 - 3 points if you reach proficient or mastered.
 - 2 points for familiar.
 - 1 point for attempted.
 - You must complete the quizzes and the unit test.

I look forward to working with you next year!

If you need help on this assignment over the summer, please send me an email (carrie.odonnell@sno.wednet.edu). If this seems overwhelming, don't panic and certainly don't quit on Calculus. Just get in touch with me and I'll gladly help you out. This goes for the entire year.

Best regards,

Ms. O'Donnell

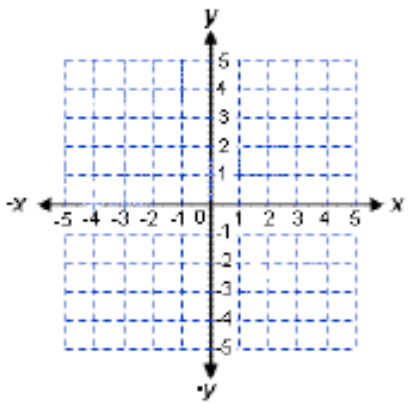
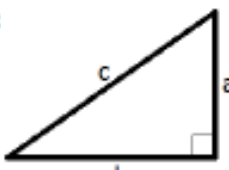
Section 1 (pg.1) - Review

Stuff You Must Know Cold from Algebra 1

<p><u>Powers of 2</u></p> $2^2 = 4$ $2^3 = 8$ $2^4 = 16$ $2^5 = 32$ $2^6 = 64$ $2^7 = 128$ $2^8 = 256$ $2^9 = 512$ $2^{10} = 1024$ $2^{11} = 2048$ $2^{12} = 4096$	$19^2 = 361$ $20^2 = 400$ $21^2 = 441$ $22^2 = 484$ $23^2 = 529$ $24^2 = 576$ $25^2 = 625$	<p><u>Inequality Meanings</u></p> $<$ less than \leq less than or equal to $>$ greater than \geq greater than or equal to
<p><u>Squares</u></p> $3^2 = 9$ $4^2 = 16$ $5^2 = 25$ $6^2 = 36$ $7^2 = 49$ $8^2 = 64$ $9^2 = 81$ $10^2 = 100$ $11^2 = 121$ $12^2 = 144$ $13^2 = 169$ $14^2 = 196$ $15^2 = 225$ $16^2 = 256$ $17^2 = 289$ $18^2 = 324$	<p><u>Cubes</u></p> $3^3 = 27$ $4^3 = 64$ $5^3 = 125$ $6^3 = 216$ $7^3 = 343$ $8^3 = 512$ $9^3 = 729$ $10^3 = 1000$ $11^3 = 1331$ $12^3 = 1728$	<p><u>Linear Equations</u></p> Parent Function: $y = x$
	<p><u>Factorials</u></p> $0! = 1$ $1! = 1$ $2! = 2$ $3! = 6$ $4! = 24$ $5! = 120$	Standard Form: $ax + by = c$
		Slope-Intercept Form: $y = mx + b$
		Point-Slope Form: $y - y_1 = m(x - x_1)$
		Slope: $\frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$
		Graph: $y =$ (label 3 points)

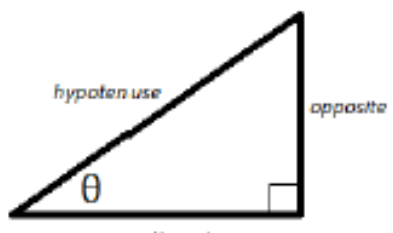
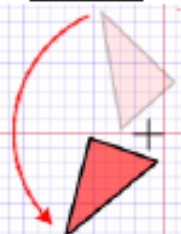
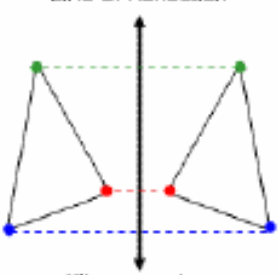
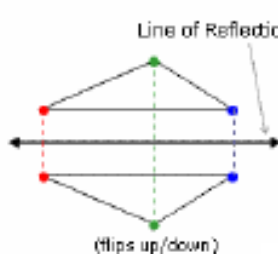
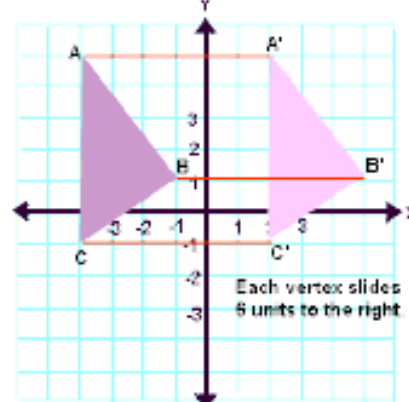
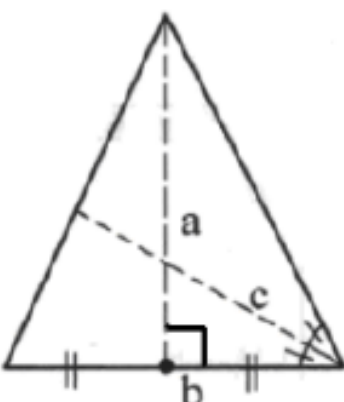
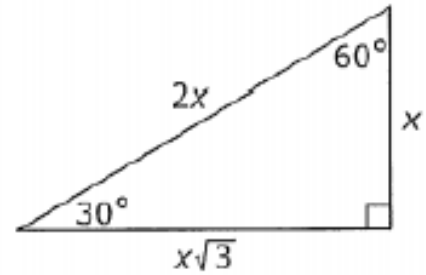
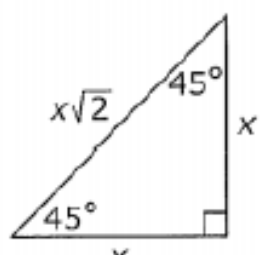
Section 1 (pg.2) - Review

Stuff You Must Know Cold from Geometry

<p><u>Quadratic Equations</u></p> <p>Parent Function: $y = x^2$</p> <p>Standard Form (Vertex Form): $y = a(x - h)^2 + k$</p> <p>General Form: $y = ax^2 + bx + c$</p> <p>Vertex: (h, k)</p> <p>Axis of Symmetry: $x = \frac{-b}{2a}$</p> <p>Quadratic Formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$</p> <p>Graph: $y =$ (label 3 points)</p> 	<p><u>Order of Operations</u></p> <ol style="list-style-type: none"> 1. Brackets 2. Exponents 3. Multiply & Divide (left to right) 4. Add & Subtract (left to right) <p><u>Function Definitions</u></p> <p>Domain: <i>The set of all possible input values (usually x)</i></p> <p>Range: <i>The set of all possible output values (usually y)</i></p> <p>Function: <i>A relation where each element in the domain (x) matches with exactly one element of the range (y)</i></p> <p>Direct Variation: $y = kx$</p> <p>Indirect Variation: $y = \frac{k}{x}$</p> <p>Roots: <i>The x-intercepts of a function, where the function (y) equals zero. Roots are also known as solutions, zeros, and x-intercepts.</i></p>	<p><u>Midpoint Formula</u></p> <p>$(m_1, m_2) =$ $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$</p> <p>Use a, b, and c to describe the following properties:</p> <p><u>Commutative Property</u></p> <p>Addition: $a + b = b + a$</p> <p>Multiplication: $a \cdot b = b \cdot a$</p> <p><u>Associative Property</u></p> <p>Addition: $a + (b + c) = (a + b) + c$</p> <p>Multiplication: $a \cdot (b \cdot c) = (a \cdot b) \cdot c$</p> <p><u>Distributive Property</u></p> <p>$a(b + c) = ab + ac$</p>
<p><u>Absolute Value</u></p> <p>$a \geq 0$</p> <p>$a = a$</p> <p>$-a = a$</p>	<p><u>Distance Formula</u></p> <p>$d = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$</p>	<p><u>Pythagorean Theorem</u></p> <p>$c^2 = a^2 + b^2$</p> 

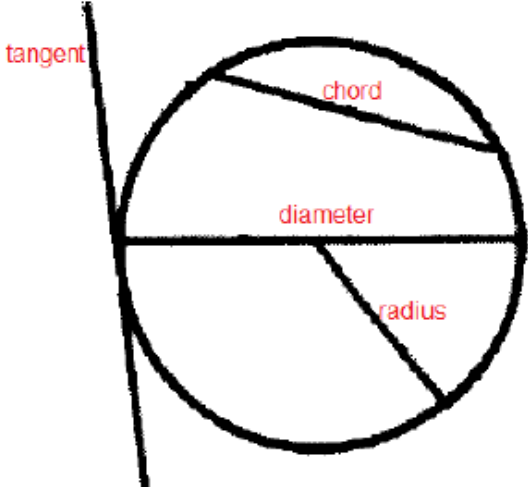
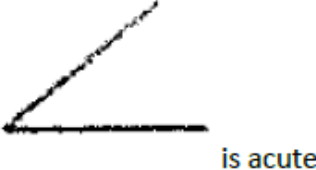
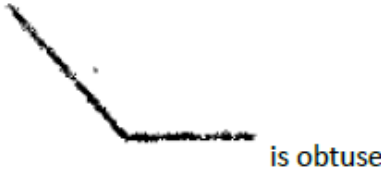
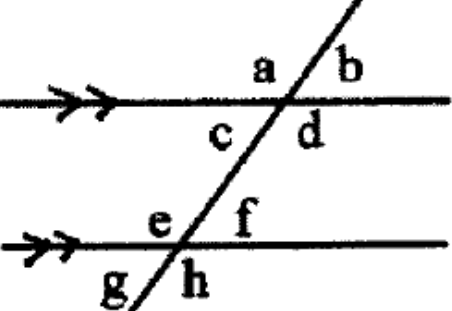
Section 1 (pg.3) - Review

Stuff You Must Know Cold from Trigonometry

<p><u>Trigonometric Ratios</u></p> $\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$ $\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$ $\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$ 	<p><u>Triangle Congruence</u></p> <ol style="list-style-type: none"> 1. Side-Side-Side (SSS) 2. Side-Angle-Side (SAS) 3. Angle-Side-Angle (ASA) 4. Angle-Angle-Side (AAS) 5. Hypotenuse-Leg (HL) <p>http://www.mathopenref.com/congruenttriangles.html</p>	<p><u>Transformations</u></p> <ol style="list-style-type: none"> 1. <u>Rotation</u>  <ol style="list-style-type: none"> 2. <u>Horizontal Reflection</u> <p>Line of Reflection</p>  <p>(flips across)</p> <ol style="list-style-type: none"> 3. <u>Vertical Reflection</u> <p>Line of Reflection</p>  <p>(flips up/down)</p> <ol style="list-style-type: none"> 4. <u>Translation</u>  <p>Each vertex slides 6 units to the right</p>
<p><u>Parts of a Triangle</u></p>  <p>a: altitude (height) b: base (with midpoint) c: angle bisector</p>	<p><u>Special Right Triangles</u></p> <p>30° - 60° - 90° triangle</p>  <p>45° - 45° - 90° triangle</p> 	
<p><u>Similarity</u></p> <p>Ratio of Sides: $m:n$</p> <p>Ratio of Perimeters: $m:n$</p> <p>Ratio of Areas: $m^2:n^2$</p> <p>Ratio of Volumes: $m^3:n^3$</p>		

Section 1 (pg.4) - Review

Other Stuff You Must Know Cold from Geometry

<p><u>Perimeter Formulas</u></p> <p>Square: $P = 4s$</p> <p>Rectangle: $P = 2l + 2w$</p> <p>Circumference: $C = \pi r^2$</p>	<p><u>Roots to Know</u></p> <p>$\sqrt{2} \approx 1.41$</p> <p>$\sqrt{3} \approx 1.73$</p>	
<p><u>Area Formulas</u></p> <p>Square: $A = s^2$</p> <p>Rectangle: $A = l \cdot w$</p> <p>Parallelogram: $A = b \cdot h$</p> <p>Trapezoid: $A = \frac{1}{2}(b_1 + b_2)h$</p> <p>Circle: $A = \pi r^2$</p> <p>Triangle: $A = \frac{1}{2}b \cdot h$</p> <p>Regular Polygon: $A = \frac{1}{2}a \cdot p$</p>	<p><u>Parts of a Circle</u></p> 	
<p><u>Surface Area Formulas</u></p> <p>Cube: $S = 6s^2$</p> <p>Sphere: $S = 4\pi r^2$</p> <p>Cylinder: $S = 2B + Ch$</p>	<p><u>Types of Angles:</u></p> 	<p>Complementary angles add up equal <u>90°</u>.</p>
<p><u>Volume Formulas</u></p> <p>Cube: $V = s^3$</p> <p>Prism/Cylinder: $V = B \cdot h$</p> <p>Pyramid/Cone: $V = \frac{1}{3}B \cdot h$</p> <p>Sphere: $V = \frac{4}{3}\pi r^3$</p>		<p>Supplementary angles add up equal <u>180°</u>.</p>
<p><u>Sum of Interior Angles</u></p> <p>Triangle = 180°</p> <p>Quadrilateral = 360°</p> <p>Regular Polygon = 180° (n-2)</p>	 <p>Angle a is congruent to: <u>Angles $d, e,$ and h</u></p> <p>Angle a is supplementary to: <u>Angles $b, c, f,$ and g</u></p>	

Section 1 (pg.5) - Review

www.khanacademy.org/math/algebra/algebra-functions

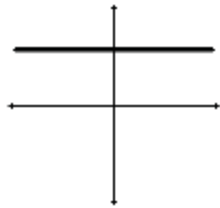


Toolkit of Functions

Students should know the basic shape of these functions and be able to graph their transformations without the assistance of a calculator.

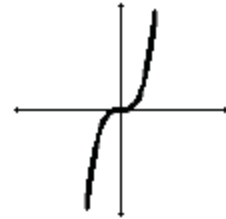
Constant

$$f(x) = a$$



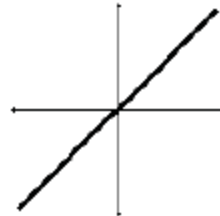
Cubic

$$f(x) = x^3$$



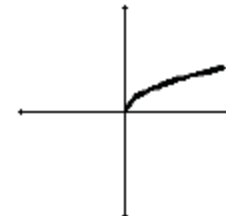
Identity

$$f(x) = x$$



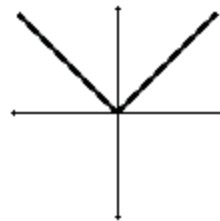
Square Root

$$f(x) = \sqrt{x}$$



Absolute Value

$$f(x) = |x|$$



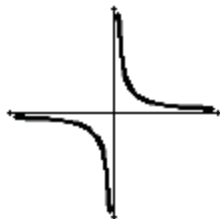
Greatest Integer

$$f(x) = [x]$$



Reciprocal

$$f(x) = \frac{1}{x}$$



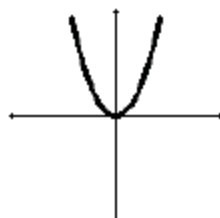
Exponential

$$f(x) = a^x$$



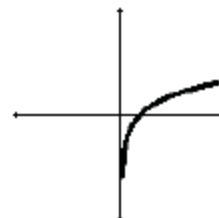
Quadratic

$$f(x) = x^2$$



Logarithmic

$$f(x) = \ln x$$



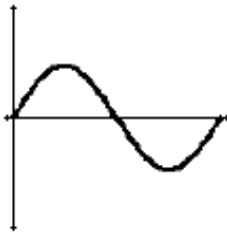
Section 1 (pg.6) - Review

<http://www.khanacademy.org/math/trigonometry>

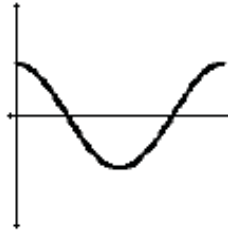


Trig Functions

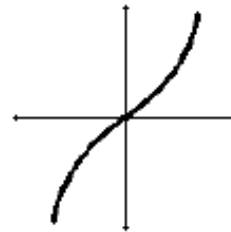
$$f(x) = \sin x$$



$$f(x) = \cos x$$



$$f(x) = \tan x$$



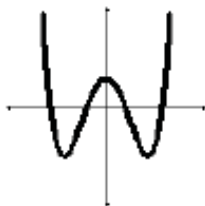
Polynomial Functions:

A function P is called a polynomial if $P(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x + a_0$
Where n is a nonnegative integer and the numbers $a_0, a_1, a_2, \dots, a_n$ are constants.

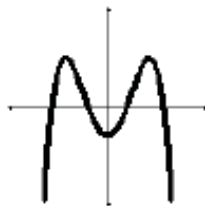
Even degree

Leading coefficient sign

Positive



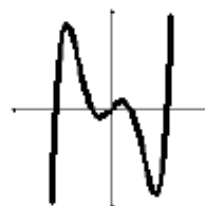
Negative



Odd degree

Leading coefficient sign

Positive



Negative



- Number of roots equals the degree of the polynomial.
- Number of x intercepts is less than or equal to the degree.
- Number of "turns" is less than or equal to (degree - 1).

Section 1 (pg.7) - Review

Trigonometric Identities

**** Memorize the marked families of Identities**

** Reciprocal Identities

$$\sin X = \frac{1}{\csc X}$$

$$\cos X = \frac{1}{\sec X}$$

$$\tan X = \frac{1}{\cot X}$$

$$\csc X = \frac{1}{\sin X}$$

$$\sec X = \frac{1}{\cos X}$$

$$\cot X = \frac{1}{\tan X}$$

** Quotient Identities

$$\tan X = \frac{\sin X}{\cos X}$$

$$\cot X = \frac{\cos X}{\sin X}$$

** Pythagorean Identities

$$\sin^2 X + \cos^2 X = 1$$

$$1 + \tan^2 X = \sec^2 X$$

$$1 + \cot^2 X = \csc^2 X$$

** Even Identities

$$\cos(X) = \cos(-X)$$

$$\sec(X) = \sec(-X)$$

** Odd Identities

$$\sin(-X) = -\sin(X)$$

$$\csc(-X) = -\csc(X)$$

$$\tan(-X) = -\tan(X)$$

$$\cot(-X) = -\cot(X)$$

Co-Function Identities

$$\sin\left(\frac{\pi}{2} - X\right) = \cos(X)$$

$$\cos\left(\frac{\pi}{2} - X\right) = \sin(X)$$

$$\tan\left(\frac{\pi}{2} - X\right) = \cot(X)$$

$$\cot\left(\frac{\pi}{2} - X\right) = \tan(X)$$

$$\sec\left(\frac{\pi}{2} - X\right) = \csc(X)$$

$$\csc\left(\frac{\pi}{2} - X\right) = \sec(X)$$

Power Reducing Formulas

$$\sin^2 u = \frac{1 - \cos 2u}{2}$$

$$\cos^2 u = \frac{1 + \cos 2u}{2}$$

$$\tan^2 u = \frac{1 - \cos 2u}{1 + \cos 2u}$$

Sum and Difference Formulas

$$\sin(u + v) = \sin u \cos v + \cos u \sin v$$

$$\sin(u - v) = \sin u \cos v - \cos u \sin v$$

$$\cos(u + v) = \cos u \cos v - \sin u \sin v$$

$$\cos(u - v) = \cos u \cos v + \sin u \sin v$$

$$\tan(u + v) = \frac{\tan u + \tan v}{1 - \tan u \tan v}$$

$$\tan(u - v) = \frac{\tan u - \tan v}{1 + \tan u \tan v}$$

Double Angle Formulas

$$\sin 2u = 2 \sin u \cos u$$

$$\tan 2u = \frac{2 \tan u}{1 - \tan^2 u}$$

$$\cos 2u = \cos^2 u - \sin^2 u$$

$$\cos 2u = 2 \cos^2 u - 1$$

$$\cos 2u = 1 - 2 \sin^2 u$$

Half Angle Formulas

$$\sin \frac{u}{2} = \pm \sqrt{\frac{1 - \cos u}{2}}$$

$$\cos \frac{u}{2} = \pm \sqrt{\frac{1 + \cos u}{2}}$$

$$\tan \frac{u}{2} = \frac{1 - \cos u}{\sin u} = \frac{\sin u}{1 + \cos u}$$

The signs of $\sin \frac{u}{2}$ and $\cos \frac{u}{2}$ depend on the quadrant in which $\frac{u}{2}$ lies.

Product to Sum Formulas

$$\sin u \sin v = \frac{1}{2} [\cos(u - v) - \cos(u + v)]$$

$$\cos u \cos v = \frac{1}{2} [\cos(u - v) + \cos(u + v)]$$

$$\sin u \cos v = \frac{1}{2} [\sin(u + v) + \sin(u - v)]$$

$$\cos u \sin v = \frac{1}{2} [\sin(u + v) - \sin(u - v)]$$

Sum to Product Formulas

$$\sin u + \sin v = 2 \sin\left(\frac{u + v}{2}\right) \cos\left(\frac{u - v}{2}\right)$$

$$\sin u - \sin v = 2 \cos\left(\frac{u + v}{2}\right) \sin\left(\frac{u - v}{2}\right)$$

$$\cos u + \cos v = 2 \cos\left(\frac{u + v}{2}\right) \cos\left(\frac{u - v}{2}\right)$$

$$\cos u - \cos v = -2 \sin\left(\frac{u + v}{2}\right) \sin\left(\frac{u - v}{2}\right)$$

Section 1 (pg.8) - Review

Unit Circle

You must be able to use the unit circle... from memory!

