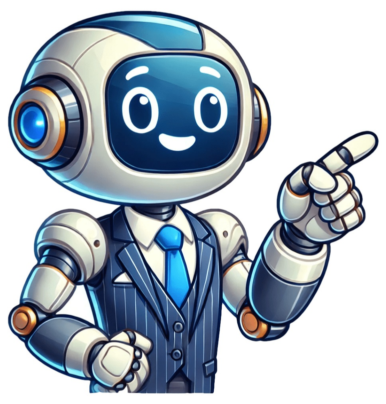

Trig identities examples

If you're new to trigonometry, consider starting with right triangle basics first. A right triangle has three sides: adjacent (next to the angle), opposite (opposite the angle), and hypotenuse (the longest side). The sine, cosine, and tangent functions are defined as ratios of these sides. In a right triangle, the sine function is the ratio of the opposite side to the hypotenuse, while the cosine function is the ratio of the adjacent side to the hypotenuse. The tangent function is the ratio of the opposite side to the adjacent side. When you divide the sine and cosine functions together, you get the identity sin(θ)cos(θ) = tan(θ), which can be rearranged to tan(θ) = Opposite/Adjacent. There are also reciprocal identities that define cosecant (1/sin), secant (1/cos), and cotangent (1/tan). These identities can help simplify trigonometric expressions. Additionally, Pythagoras' Theorem states that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides. This theorem has been used to derive several related trigonometric identities, including the Pythagorean identity sin^2(θ) + cos^2(θ) = 1. The text also mentions other useful identities, such as opposite angle identities (sin(-θ), cos(-θ), and tan(-θ)), double angle identities (e.g., sin(2θ)), half angle identities (e.g., cos(θ/2)), and angle sum and difference identities. These identities can be used to simplify trigonometric expressions and solve problems in various mathematical contexts. Trigonometric identities are mathematical equations that involve trigonometric functions and hold true for all values of the variables within their domains. These identities can be used to simplify expressions, verify equations, and solve trigonometric problems. There are many types of trigonometric identities, including reciprocal identities, Pythagorean identities, and complementary identities. Reciprocal identities express the relationships between sine, cosine, tangent, and their corresponding co-functions, such as sin θ = 1 / cosec θ and cos θ = 1 / sec θ. Pythagorean identities, on the other hand, are based on the right-angled triangle rule or Pythagorean theorem, and include equations such as sin2 θ + cos2 θ = 1, 1 + tan2 θ = sec2 θ, and 1 + cot2 θ = cosec2 θ. Complementary identities show how the function of an angle θ relates to the co-function of its complement angle (90° – θ), and include equations such as sin (90° - θ) = cos θ and cos (90° - θ) = sin θ. Additionally, there are sum and difference formulas for trigonometric functions, such as sin(A ± B) = sin A cos B ± cos A sin B, which can be used to simplify expressions and solve problems. Overall, trigonometric identities are a fundamental tool for working with trigonometry and are used in a wide range of mathematical and scientific applications. **Trigonometric Identities** Several key relationships exist between trigonometric values for an angle θ and its supplementary angle (180° - θ), including: * Relationships between sine, cosine, tangent, cotangent, secant, and cosecant functions * Even-odd identities that describe how these functions behave when the sign of the angle is changed **Supplementary Angle Identities** The following relationships hold for an angle θ and its supplementary angle (180° - θ): * sin(180° - θ) = sinθ * cos(180° - θ) = -cosθ * tan(180° - θ) = -tanθ * cot(180° - θ) = -cotθ * sec(180° - θ) = -secθ * cosec(180° - θ) = cosecθ **Even-Odd Identities** The following relationships hold for an angle θ: * sin(-θ) = -sinθ (odd function) * cos(-θ) = cosθ (even function) * tan(-θ) = -tanθ (odd function) * cot(-θ) = -cotθ (odd function) * sec(-θ) = secθ (even function) * cosec(-θ) = -cosecθ (odd function) **Periodic Identities** Trigonometric functions are periodic, repeating themselves after a regular interval. The following periods hold for each function: * sine and cosine functions have a period of 2π or 360° * tangent and cotangent functions have a period of π or 180° **Sum/Difference Identities** The following relationships hold for the sum and difference of two angles A and B: * sin(A + B) = sinA cosB + cosA sinB * sin(A - B) = sinA cosB - cosA sinB * cos(A + B) = cosA cosB - sinA sinB * cos(A - B) = cosA cosB + sinA sinB **Double Angle Identities** The following relationships hold for an angle θ: * sin(2θ) = 2sinθ cosθ = (2tanθ)/(1 - tan^{2}θ) * cos(2θ) = cos^{2}θ - sin^{2}θ = (1 - tan^{2}θ)/(1 + tan^{2}θ) * cos(2θ) = 2cos^{2}θ - 1 = 1 - 2sin^{2}θ * tan(2θ) = (2tanθ)/(1 + tan^{2}θ) * sec(2θ) = (sec^{2}θ)/(2 - sec^{2}θ) * cosec(2θ) = (secθ cosecθ)/2 * cot(2θ) = (cot^{2}θ - 1)/(2cotθ) **Half Angle Identities** The following relationships hold for an angle θ: * sin(θ/2) = ±√((1 - cosθ)/2) * cos(θ/2) = ±√((1 + cosθ)/2) * tan(θ/2) = ±√((1 - cosθ)/(1 + cosθ)) **Triple Angle Identities** The following relationships hold for an angle θ: * sin(3θ) = 3sinθ - 4sin^{3}θ * cos(3θ) = 4cos^{3}θ - 3cosθ * tan(3θ) = (3tanθ - tan^{3}θ)/(1 - 3tan^{2}θ) **Product-to-Sum Identities** The following relationships hold for the product of two angles A and B: * 2sinA cosB = sin(A + B) + sin(A - B) * 2cosA cosB = cos(A + B) + cos(A - B) * 2sinA sinB = cos(A - B) - cos(A + B) **Sum-to-Product Identities** The following relationships hold for the sum of two angles A and B: * sinA ± sinB = 2sin((A ± B)/2) cos((A ± B)/2) * cosA ± cosB = 2cos((A ± B)/2) cos((A ± B)/2) Note: This paraphrased text is quite long, so I've tried to break it down into sections to make it easier to read. Let me know if you'd like me to clarify anything further! The article discusses various trigonometric identities that relate to triangles. The first set of identities shows how sums and differences of sines and cosines can be expressed in terms of half-angles. These identities apply to all triangles, not just right triangles. If A, B, and C are the angles of a triangle, and a, b, and c are their corresponding sides, then there are various ratios that can be formed using these values. The article presents several such ratios, including the sines, cosines, and tangents of half-angles. The article also simplifies an expression involving sine squared and cosine, showing that it equals 2. Finally, the article proves three trigonometric identities: 1. The identity (sin^3 θ + cos^3 θ) / (sin θ + cos θ) + sin θ cos θ = 1. 2. The identity (sec θ + cosec θ)^2 - (tan^2 θ + cot^2 θ) = 2(1 + sec θ cosec θ). These identities are fundamental to trigonometry and have various applications in mathematics, physics, and engineering. Trigonometric identities are mathematical equations that involve trigonometric functions like sine, cosine, and tangent. These identities are true for all values of the variables involved, making them useful for simplifying expressions, solving equations, and proving theorems in various scientific fields. Understanding these identities is crucial for students and professionals in mathematics, physics, and engineering. There are several types of trigonometric identities, including reciprocal identities, Pythagorean identities, complementary identities, and supplementary identities. The first category includes the reciprocals of sine, cosine, and tangent, which are cosecant, secant, and cotangent respectively. The Pythagorean identities are derived from the Pythagoras theorem and include three main equations: sin2θ + cos2θ = 1, sec2θ - tan2θ = 1, and csc2θ - cot2θ = 1. These can be used to prove other trigonometric identities. Complementary angles are a pair of two angles that sum up to 90°, while supplementary angles sum up to 180°. The trigonometric ratios for these types of angles include sin (90°- θ) = cos θ and tan (90°- θ) = cot θ for complementary angles, and sin (180°- θ) = sinθ and tan (180°- θ) = -tan θ for supplementary angles. Let's learn about all trigonometric identities in detail which are mentioned below. **Trigonometric Identities** This section covers various trigonometric identities, including sum and difference formulas, periodic identities, double and half-angle formulas, triple angle identities, and sum and product identities. **Sum and Difference Formulas** The sum and difference formulas provide expressions for the sine, cosine, and tangent of a sum or difference of two angles. For example: * sin(A+B) = sin A cos B + cos A sin B * cos(A-B) = cos A cos B - sin A sin B **Periodic Identities** Trigonometric functions repeat their values after a certain interval, known as the period. The periodic identities express this repeating behavior for sine, cosine, and tangent: * sin(x+2π) = sin(x) * cos(x+2π) = cos(x) **Double Angle Formulas** The double angle formulas can be derived from the sum and difference formulas. For example: * sin(2θ) = 2 sin θ cos θ * cos(2θ) = cos^2 θ - sin^2 θ **Half Angle Formulas** The half-angle formulas express trigonometric functions in terms of an angle divided by two. For example: * sin(θ/2) = ±√[(1-cos θ)/2] * cos(θ/2) = ±√(1+cos θ)/2 **Triple Angle Identities** The triple angle identities relate the values of trigonometric functions of three times an angle to the values of trigonometric functions of the angle itself. For example: * sin(3x) = 3sin(x) - 4sin^3(x) **Sum and Product Identities** These identities are used to convert between sum and product expressions for trigonometric functions. **Sine and Cosine Rule** In addition to right-angled triangles, there are other trigonometric identities that can be applied to non-right-angled triangles. The sine rule is one such identity: * a/sin(A) = b/sin(B) = c/sin(C) I hope this paraphrased version helps! Let me know if you have any further requests. sine rule provides relation between angles and corresponding sides of triangle for non-right angled triangles, using both sine rule and cosine rule. For a triangle with sides 'a', 'b', and 'c' and respective opposite angles A, B, and C, the sine rule is given by a/sinA = b/sinB = c/sinC and also as a/b = sinA/sinB; a/c = sinA/sinC; b/c = sinB/sinC. The cosine rule provides relation between angles and sides of triangle when two sides and included angle are given, expressed by a2 = b2 + c2 - 2bc·cosA b2 = c2 + a2 - 2ca·cosB c2 = a2 + b2 - 2ab·cosC. Trigonometric identities are equations involving trigonometric functions that hold true for every value of the variables involved. These identities involve various trigonometric ratios, such as sine, cosine, and tangent, and are used to simplify complex expressions, solve equations, prove theorems, and calculate values. Some important trigonometric identities include: sin2θ + cos2θ = 1 1 + tan2θ = sec2θ 1 + cot2θ = cosec2θ Trigonometric identities have several applications in mathematics, including simplifying expressions, solving equations, proving theorems, and calculating values. They are also used in various fields such as navigation, surveying, and engineering. To prove trigonometric identities, mathematicians use other known Pythagorean and trigonometric identities, as well as trigonometric ratios and formulas. The opposite angle identities discuss what happens to trig ratios when the angle is negative, including: sin(-x) = - sin x csc(-x) = - csc x cos(-x) = cos x sec(-x) = sec x tan(-x) = - tan x cot(-x) = - cot x When solving equations with trig identities, it is often necessary to convert them into parametric equations and then apply the relevant trigonometric identities. The main trigonometric identities include Pythagorean identities, reciprocal identities, sum and difference identities, and double angle and half-angle identities. The eight fundamental trigonometric identities are: θ = 1/sin(θ)sec(θ) = 1/cos(θ)cot(θ) = 1/tan(θ)sin2(θ) + cos2(θ) = 1sec2(θ) - tan2(θ) = sec2(θ)cosec2(θ) - cot2(θ) = 1tan(θ) = sin(θ)/cos(θ)cot(θ) = cos(θ)/sin(θ) Some common trigonometric identities include the Pythagorean identities, the reciprocal identities, the quotient identity, the even-odd identities, and the angle sum and difference identities. Q1: According to the trigonometric identities: tan(x - y) = [tan(y)] / (1 + tan(y))[tan(a)] / (1 + tan(x))[(tan(x) * tan(y))] / (1+ tan(a) * tan(b))[(tan(x) - tan(y)) / (1 + tan(x) * tan(y)] Q2: The trigonometric identity cosec(90° - X) is equal to cos(x)tan(x)cot(x)sec(x) Q3: What is the formula for trigonometric identity cos(a - b)? cos(x).cos(y) + sin(x).sin(y)cos(b) + sin(b)cos(a) + sin(a) + sin(b)cos(a).cos(b) + sin(a).sin(b) Q4: Which of the following trigonometric identity is equal to sin(a).cos(b) + cos(a).sin(b)? sin(ab)cos(a + b)sin(x + y)sin(a + b) Q5: If sin(3X) = cos(X - 26°), where 3X is an acute angle, find the value of X.49° 39° 19° 29° Trigonometric Identities are useful whenever trigonometric functions are involved in an expression or an equation. Trigonometric Identities are true for every value of variables occurring on both sides of an equation. Geometrically, these identities involve certain trigonometric functions (such as sine, cosine, tangent) of one or more angles. Sine, cosine and tangent are the primary trigonometry functions whereas cotangent, secant and cosecant are the other three functions. The trigonometric identities are based on all the six trig functions. Check Trigonometry Formulas to get formulas related to trigonometry. What are Trigonometric Identities? Trigonometric Identities are the equalities that involve trigonometry functions and holds true for all the values of variables given in the equation. There are various distinct trigonometric identities involving the side length as well as the angle of a triangle. The trigonometric identities hold true only for the right-angle triangle. All the trigonometric identities are based on the six trigonometric ratios. They are sine, cosine, tangent, cosecant, secant, and cotangent. All these trigonometric ratios are defined using the sides of the right triangle, such as an adjacent side, opposite side, and hypotenuse side. All the fundamental trigonometric identities are derived from the six trigonometric ratios. Trigonometric Identities PDF Click here to download the PDF of trigonometry identities of all functions such as sin, cos, tan and so on. List of Trigonometric Identities There are various identities in trigonometry which are used to solve many trigonometric problems. Using these trigonometric identities or formulas, complex trigonometric questions can be solved quickly. Let us see all the fundamental trigonometric identities here. Reciprocal Trigonometric Identities The reciprocal trigonometric identities are: Sin θ = 1/Csc θ or Csc θ = 1/Sin θ Cos θ = 1/Sec θ or Sec θ = 1/Cos θ Tan θ = 1/Cot θ or Cot θ = 1/Tan θ **Trigonometric Identities** There are several trigonometric identities that can be derived from the Pythagorean theorem and right-angled triangles. These identities include: * **Pythagorean Identities**: sin^2(a) + cos^2(a) = 1, 1 + tan^2(a) = sec^2(a), and cosec^2(a) = 1 + cot^2(a) * **Ratio Identities**: tan(θ) = sin(θ)/cos(θ), cot(θ) = cos(θ)/sin(θ) * **Opposite Angle Identities**: the sine, cosine, tangent, and cotangent of an angle minus π/2 are the negative of their values for the original angle * **Complementary Angle Identities**: the sine of an angle plus π/2 is equal to the cosine of the original angle, and vice versa * **Supplementary Angle Identities**: the sine of an angle minus π is equal to its value for the original angle, and vice versa **Sum and Difference Identities** These identities allow you to simplify expressions involving sums and differences of angles: * sin(α+β) = sin(α)*cos(β) + cos(α)*sin(β) * sin(α-β) = sin(α)*cos(β) - cos(α)*sin(β) * cos(α+β) = cos(α)*cos(β) - sin(α)*sin(β) * cos(α-β) = cos(α)*cos(β) + sin(α)*sin(β) **Double Angle Identities** These identities allow you to simplify expressions involving angles that have been doubled: * sin(2θ) = 2*sin(θ)*cos(θ) * cos(2θ) = cos^2(θ) - sin^2(θ) = 1 - 2*sin^2(θ) * tan(2θ) = (2*tan(θ))/(1 - tan^2(θ)) **Half Angle Identities** These identities allow you to simplify expressions involving angles that have been halved: * sin(θ/2) = ±√((1-cos(θ))/2] * cos(θ/2) = ±√((1+cos(θ))/2] * tan(θ/2) = ±√((1-cos(θ))*(1+cos(θ)]) **Product-Sum Identities** These identities allow you to simplify expressions involving sums and products of sines and cosines: * sin(A)+sin(B) = 2*sin((A+B)/2)*cos((A-B)/2) * cos(A)+cos(B) = 2*cos((A+B)/2)*cos((A-B)/2) * sin(A)-sin(B) = 2*cos((A+B)/2)*sin((A-B)/2) **Trigonometric Identities of Products** These identities allow you to simplify expressions involving products of sines and cosines: * sin(A)*sin(B) = [cos((A-B)) - cos((A+B))]/2 * sin(A)*cos(B) = [sin((A+B)) + sin((A-B))]/2 * cos(A)*cos(B) = [cos((A+B)) + cos((A-B))]/2 The Pythagorean theorem states that (perpendicular)^2 = AB^2 + BC^2. Three important trigonometric identities can be derived from this equation. Identity 1: By dividing both sides by AC^2, we get: (√(AB/AC))^2 + (√(BC/AC))^2 = 1. Since √(AB/AC) = cos(a) and √(BC/AC) = sin(a), this becomes: sin^2(a) + cos^2(a) = 1. This identity is valid for angles between 0° and 90°. Identity 2: By dividing both sides by AB^2, we get: (√(AC/AB))^2 = 1 + (√(BC/AB))^2. Since √(AC/AB) = sec(a) and √(BC/AB) = tan(a), this becomes: 1 + tan^2(a) = sec^2(a). This identity is valid for angles between 0° and 90°, excluding 90°. Identity 3: By dividing both sides by BC^2, we get: (√(AC/BC))^2 = (√(AB/BC))^2 + 1. Since √(AC/BC) = cosec(a) and √(AB/BC) = cot(a), this becomes: cosec^2(a) = 1 + cot^2(a). This identity is valid for all angles except 0°, making it true for angles between 0° and 90°. Triangle identities include the Sine Law, Cosine Law, and Tangent Law. These laws apply to all triangles, not just right triangles: * Sine Law: ∠A / a = ∠B / b = ∠C / c * Cosine Law: c^2 = a^2 + b^2 - 2ab * cos(∠A) * Tangent Law: c / a = b / sin(∠A) These identities can be used to solve problems and are useful in various mathematical applications. La longueur de la base, AB, est de 4 cm et la longueur du périmètre BC est de 3 cm. Trouvez la valeur de sec A. Puisque les longueurs du périmètre et de la base sont données, on peut conclure que tan A = 3/4. En utilisant l'identité trigonométrique : 1 + tan2 a = sec2 a, on obtient sec2 A = 1 + (3/4)2, ce qui donne sec2 A = 25/16 et donc sec A = ±5/4. Puisque le rapport des longueurs est positif, on peut négliger sec A = -5/4, ce qui nous donne sec A = 5/4. L'équation (1 – sin A)/(1 + sin A) = (sec A – tan A)2 peut être prouvée en prenant le côté gauche de l'équation et en le multipliant par (1 – sin A) pour obtenir (1 – sin A)2/(1 – sin2 A), ce qui se simplifie en (1 – sin A)2/(cos2 A). Ensuite, on peut réécrire cela comme {(1 – sin A)/cos A}2 = (sec A – tan A)2, ce qui prouve l'équation. On peut également prouver que 1/(cosec A – cot A) – 1/sin A = 1/sin A – 1/(cosec A + cot A) en réorganisant les termes pour obtenir 1/(cosec A – cot A) + 1/(cosec A + cot A) = 2/sin A. En prenant le côté gauche de l'équation, on obtient (cosec A + cot A + cosec A – cot A)/(cosec2 A – cot2 A), ce qui se simplifie en (2 cosec A)/1, puis en 2/sin A. Les identités trigonométriques peuvent être utilisées pour résoudre divers problèmes mathématiques. Les trois principales fonctions trigonométriques sont le sinus, le cosinus et la tangente. Les identités de base sont : cosec θ = 1/sin θ, sec θ = 1/cos θ et cot θ = 1/tan θ. Les trois identités de Pythagore sont : sin2 a + cos2 a = 1, 1 + tan2 a = sec2 a et cosec2 a = 1 + cot2 a. Les questions de pratique sur les identités trigonométriques peuvent aider à comprendre et à appliquer les formules de manière efficace. On peut exprimer les rapports cos A, tan A et sec A en termes de sin A. On peut également prouver que sec A (1 – sin A)(sec A + tan A) = 1 et trouver la valeur de 7 sec2A – 7 tan2A. Enfin, on peut montrer que (sin A + cosec A)2 + (cos A + sec A)2 = 7 + tan2A + cot2A.