

Review
Fundamental Concepts and Techniques of Calculus

Hints to the Exercises: Trigonometry

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1. Apply the Basic Trigonometric Identities to Simplify Expressions:

(a) Use the Double-Angle Identity

$$\sin(2x) = 2 \sin x \cos x$$

and the Power Identity

$$\cos^2 x = \frac{1}{2}(1 + \cos 2x)$$

(b) Factor out $2 \sin x \cos x$ and use the Double-Angle Identities.

(c) Factor the numerator using $a^2 - b^2 = (a - b)(a + b)$ and apply the Pythagorean Identity $1 + \tan^2 x = \sec^2 x$.

(d) Simplify the term.

(e) Reduce the fraction! First factor out $\sin x \cos x$ in the numerator.

(f) Apply the Pythagorean Identity $1 + \tan^2 \theta = \sec^2 \theta$, rewrite the fraction in terms of sin and cos and reduce it!

(g) Separate terms and rewrite in terms of sin and cos.

(h) First use the Addition formulae for sin and expand the expression. Then apply the Power Identities and expand again.

(i) Combine the fractions and apply the third Pythagorean Identity.

(j) Separate the fraction.

(k) Apply the suitable Pythagorean identities to the fraction.

2. Recall the Sum and Difference Formulas for Sine and Cosine:

(a) See Summary Sheet!

(b) See Summary Sheet!

(c) See Summary Sheet!

(d) See Summary Sheet!

3. See Summary Sheet!

4. Recall the Double and Half Angle Formulas for Sine and Cosine:

(a) See Summary Sheet!

(b) See Summary Sheet!

(c) See Summary Sheet!

(d) See Summary Sheet!

(e) See Summary Sheet!

(f) See Summary Sheet!

(g) See Summary Sheet!

(h) See Summary Sheet!

5. Recall the Law of Sines and Law of Cosines; Determine which Law applies; Solve Triangle:

(a) To compute a use the law of cosine, β can be computed with the law of sine.

(b) The side b can be computed using the law of cosine, the angle α with the law of sine.

(c)

(d)

(e)

6. Recall the Trigonometric Values of Angles which are Multiples of $\frac{\pi}{4}$ And $\frac{\pi}{6}$, and find the exact Value:

(a) (e)

(b) (f)

(c) (g)

(d)

7. Simplify the Trigonometric Expression and find the exact Value: (Hint: Use Right-Triangle Construction)

(a)

(b)

(c)

(d)

(e)

(f)

(g)

8. Graph the Trigonometric Equations:

(a)

(f)

(b)

(g)

(c)

(h)

(d)

(i)

(e)

(j)

9. Solve for x in the Trigonometric Equations:

(a)

(b)

(c)

(d)

(e)

(f)

(g)

(h)

(i)

10. Convert Cartesian Coordinates to Polar Coordinates:

(a)

(d)

(b)

(e)

(c)

(f)

11. Convert Polar Coordinates to Cartesian Coordinates:

(a)

(e)

(b)

(f)

(c)

(g)

(d)

(h)

12. Define the Hyperbolic Trigonometric Functions in terms of the Exponential Functions:

(a)

(b)

(c)

(d)

(e)

(f)

13. Apply the Basic Hyperbolic Trigonometric Identities to simplify Expressions:

(a)

(b)

(c)

(d)

(e)

(f)