



Trigonometry with Algebra Review

Description: (4 credits) A comprehensive coverage of trigonometry and selected topics from college algebra for students intending to take calculus: measurements of angles, trigonometric functions, equations and graphs, inverse trigonometric functions, identities, polar coordinates, solutions of triangles, applications, complex numbers, DeMoivre's theorem, vectors, logarithms, exponential functions, partial fractions, conics, sequences and series. Prerequisite: MAT151. Prerequisite or corequisite: RDG100.

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Corequisites: RDG100

Measurable Student Learning Outcomes

1. (Application Level) Apply trigonometric concepts to solve right and non-right triangles using definitions, modeling, and the appropriate laws.

Question 1: A regular pentagon is inscribed in a circle of radius 15.8 cm. Find the perimeter of the pentagon. (Ans: 92.9 cm)

Question 2: Solve $\triangle ABC$, $a = 32$, $b = 71$, and $C = 32.8^\circ$. (Ans: $A = 21.1^\circ$, $B = 126.1^\circ$, $c = 47$)

2. (Application Level) Solve problems involving circles and angles.

Question 1: A tire on a car has an outside diameter of 36.32 in. Through what angle (in radians) does the tire turn while traveling 1 mile? (Ans: 3489)

3. (Application Level) Sketch the graphs of trigonometric functions in rectangular, polar and parametric forms and identify the period, amplitude, and shift of trigonometric functions.

Question 1: Find the amplitude, the period, and the phase shift. $y = 3 \sin \left(2x + \frac{\pi}{2} \right) + 1$
(Ans: Amplitude = 3, Period = π , Phase Shift = $-\pi/4$)

4. (Application Level) Solve trigonometric equations using trigonometric identities and inverse functions.

Question 1: Find all solutions in $[0, 2\pi)$. $2 \sin x \cos x + \sin x = 0$
(Ans: $0, 2\pi/3, \pi, 4\pi/3$)

Question 2: Find all solutions in $[0^\circ, 360^\circ)$. $10\sin^2 x - 12\sin x - 7 = 0$
(Ans: $205.44^\circ, 334.56^\circ$)

5. (Application Level) Apply concepts of trigonometry to solve problems involving vectors.

Question 1: An airplane is flying at 200 km/h in a direction of 305° . Find the westerly component and the northerly component of its velocity.
(Ans: Northerly: 115 km/h, westerly: 164 km/h)

Question 2: Given the magnitudes of vectors \mathbf{u} and \mathbf{v} and the angle θ between the vectors. Find the sum of $\mathbf{u} + \mathbf{v}$. $|\mathbf{u}| = 54$, $|\mathbf{v}| = 43$, $\theta = 150^\circ$
(Ans: 27.3)

6. (Synthesis Level) Simplify complex numbers in trigonometric form and convert between complex and polar forms.

Question 1: Find the trigonometric notation for the complex number $\sqrt{3} - i$
(Ans: $2 \left(\cos \frac{11\pi}{6} + i \sin \frac{11\pi}{6} \right)$)

Question 2: Convert the polar equation $r = 2 \cos \theta + 3 \sin \theta$ to a rectangular equation.
(Ans: $x^2 + y^2 = 2x + 3y$)

7. (Application Level) Graph equations of conic sections.

Question 1: Find the center, the vertices, and the foci of the ellipse. $4x^2 + y^2 + 24x - 2y + 21 = 0$
(Ans: center $(-3, 1)$, vertices $(-3, 5)$ and $(-3, -3)$, foci $(-3, 1 \pm 2\sqrt{3})$)

8. (Analysis Level) Decompose a rational expression into a sum of partial fractions.

Question 1: Decompose into partial fractions. $\frac{6x^3 + 5x^2 - 7}{3x^2 - 2x - 1}$
(Ans: $2x + 3 + \frac{5}{3x+1} + \frac{1}{x-1}$)

9. (Application Level) Solve and sketch logarithmic and exponential equations using appropriate properties.

Question 1: Solve. $\log x + \log (x + 3) = 1$

(Ans: 2)

10. (Comprehension Level) Distinguish the difference between arithmetic and geometric sequences and use appropriate formulas to find specific terms.

Question 1: Find a_{17} of the arithmetic sequence. 7, 4, 1,

(Ans: -41)

11. (Evaluation Level) Evaluate the sum of finite and infinite series.

Question 1: How many poles will be in a stack of telephone poles if there are 50 in the first layer, 49 in the second, 48 in the third, and so on, with 6 in the top layer?

(Ans: 1260)

12. (Evaluation Level) Use technology to model, investigate, solve, and/or justify solutions to given problems.

Question 1: Graph the curve represented by the parametric equations.

$$x = \frac{1}{2}t, y = t^2 - 3; -3 \leq t \leq 3$$