

Course Review

Chapter 6 - Analytic Trigonometry

6-1 Inverse Sin, Cos, Tan (*input proportion, output angle*)

$\arcsin = \text{asin} = \sin^{-1}: \sin^{-1}(y/r) = \theta$	Restrictions: D: [-1,1]; R: $[-\pi/2, \pi/2]$
$\arccos = \text{acos} = \cos^{-1}: \cos^{-1}(x/r) = \theta$	Restrictions: D: [-1,1]; R: $[0, \pi]$
$\arctan = \text{atan} = \tan^{-1}: \tan^{-1}(y/x) = \theta$	Restrictions: D: $(-\infty, \infty)$; R: $[-\pi/2, \pi/2]$

6-2 Inverse Sec, Csc, Cot (*input proportion, output angle*)

$\text{arccsc} = \text{acsc} = \text{csc}^{-1}: \text{csc}^{-1}(y/r) = \theta$	Restrictions: D: $(-\infty, -1] \cup [1, \infty)$; R: $[-\pi/2, 0) \cup (0, \pi/2]$
$\text{arcsec} = \text{asec} = \text{sec}^{-1}: \text{sec}^{-1}(x/r) = \theta$	Restrictions: D: $(-\infty, -1] \cup [1, \infty)$; R: $[0, \pi/2) \cup (\pi/2, \pi]$
$\text{arccot} = \text{acot} = \text{cot}^{-1}: \text{cot}^{-1}(y/x) = \theta$	Restrictions: D: $(-\infty, \infty)$; R: $[0, \pi]$

6-3 Trigonometric Identities (*Magic Hexagon*)

Reciprocal Identities: $\sin(x) = 1/\text{csc}(x); \cos(x) = 1/\text{sec}(x); \tan(x) = 1/\text{cot}(x)$
 $\text{csc}(x) = 1/\sin(x); \text{sec}(x) = 1/\cos(x); \text{cot}(x) = 1/\tan(x)$

Quotient Identities: $\tan(x) = \sin(x)/\cos(x); \tan(x) = \text{sec}(x)/\text{csc}(x)$
 $\sin(x) = \cos(x)/\text{cot}(x); \sin(x) = \tan(x)/\text{sec}(x)$
 $\cos(x) = \text{cot}(x)/\text{csc}(x); \cos(x) = \sin(x)/\tan(x)$
 $\text{cot}(x) = \text{csc}(x)/\text{sec}(x); \text{cot}(x) = \cos(x)/\sin(x)$
 $\text{csc}(x) = \text{sec}(x)/\tan(x); \text{csc}(x) = \text{cot}(x)/\cos(x)$
 $\text{sec}(x) = \tan(x)/\sin(x); \text{sec}(x) = \text{csc}(x)/\text{cot}(x)$

Product Identities (*cross-multiply reciprocal and quotient identities*)

Complementary Angles $\sin(x) = \cos(90^\circ - x); \cos(x) = \sin(90^\circ - x)$ NOTE: $90^\circ = \pi/2$
 $\tan(x) = \text{cot}(90^\circ - x); \text{cot}(x) = \tan(90^\circ - x)$
 $\text{sec}(x) = \text{csc}(90^\circ - x); \text{csc}(x) = \text{sec}(90^\circ - x)$

Pythagorean Identities $\sin^2\theta + \cos^2\theta = 1; \tan^2\theta + 1 = \text{sec}^2\theta; 1 + \text{cot}^2\theta = \text{csc}^2\theta;$

Even/Odd Trig Functions ODD: $\sin(-x) = -\sin(x); \text{csc}(-x) = -\text{csc}(x); \tan(-x) = -\tan(x); \text{cot}(-x) = -\text{cot}(x)$
EVEN: $\cos(-x) = \cos(x); \text{sec}(-x) = \text{sec}(x)$

6-4 Sum and Difference Formulas

6-5 Double-Angle and Half-Angle Formulas

6-6 Product-to-Sum and Sum-to-Product

6-7 Trig Equations 1

How to solve trigonometric equations

- Step 1: Look for any useful trig identities and substitute, if possible
- Step 2: Optional - Substitute variables for trig functions (record variables and values!)
- Step 3: Set equation equal to zero, if necessary
- Step 4: Solve for variable by factoring, completing the square, or quadratic formula, as needed.
- Step 5: If you substituted variables for trig functions (above), put trig functions back into equation
- Step 6: Solve the function
- Step 7: Reject any impossible solutions
- Step 8: Remember that the solutions represent reference angles - Solve for all valid solutions based on sign and quadrant ("Save All The Children")

6-8 Trig Equations 2

How to solve trigonometric equations

- Step 1: Look for any useful trig identities and substitute, if possible
- Step 2: Optional - Substitute variables for trig functions (record variables and values!)
- Step 3: Set equation equal to zero, if necessary
- Step 4: Solve for variable by factoring, completing the square, or quadratic formula, as needed.
- Step 5: If you substituted variables for trig functions (above), put trig functions back into equation
- Step 6: Solve the function
- Step 7: Reject any impossible solutions
- Step 8: Remember that the solutions represent reference angles - Solve for all valid solutions based on sign and quadrant ("Save All The Children")