Homework: pg 299 #5, 6iii, 8odd, 9odd, 12 and pg 304 – select additional practice

The “C.A.S.T.” RULE

Recall: If P(x, y) is a point on the end of a terminal arm with angle in standard position θ, then the coordinates of this point can be expressed using the equations:

 x = rcosθ y = rsinθ

If P is a point on a unit circle then r = 1 and so the coordinates are given by

 x = \_\_\_\_\_\_ y = \_\_\_\_\_\_

This is shown in the diagram below.

**(0, 1)**

**Angle in Standard Position**

**P(cos** θ,  **sin** θ**)**

θ

**Related**

**Angle**

**Terminal**

 **Arm**

**x**

β

**(1, 0)**

**(-1, 0)**

**Initial Arm**

**(0, -1)**

The angle between the terminal arm and the closest x-axis (positive or negative) is called the ‘Related Acute Angle’ or R. A. for short.

**The C. A. S. T. Rule**

Use your knowledge of the unit circle to determine the sign of sinθ, cosθ, and tanθ.

**y**

**90o**

**Quadrant II**

**Quadrant I**

**sin** θ 🡪

**cos** θ 🡪

**tan** θ 🡪

**sin** θ 🡪

**cos** θ 🡪

**tan** θ 🡪

**0o**

**180o**

**x**

**sin** θ 🡪

**cos** θ 🡪

**tan** θ 🡪

**sin** θ 🡪

**cos** θ 🡪

**tan** θ 🡪

**270o**

**Quadrant III**

**Quadrant IV**

### Example 1

Use the CAST rule to determine the sign of each trigonometric function:

a) sin (500) b) tan (1500) c) cos (2850) d) sin (2400)

e) tan (-500) f) cos (4500) g) sin (2500) h) tan (90o)

The primary trigonometric ratio for any angle larger than 90o is equal to the trigonometric ratio of the related acute angle with the sign determined by the CAST rule.

**Example 2**

Determine the trigonometric ratio in each case using the related acute angle and the CAST rule.

a) sin(240o) b) tan(120o) c) cos(-125o)

The CAST RULE can also help you solve a trigonometric equation for θ. There will (almost) always be two solutions for θ between 0o and 360o.

For example, when given an equation such as:

$$cos θ = -0.5$$

1. Identify which quadrants have cos θ equal to a negative value using the CAST rule; they are quadrant \_\_\_\_ and quadrant \_\_\_\_.
2. Use your calc, to get one of the answers.

 $cos θ =-0.5$

 $ θ =cos^{-1}(-0.5)$

 $ θ =$

1. Sketch a terminal arm on a Cartesian Grid using θ, the angle in standard

 position that you just calculated, and determine the related angle (the

 angle between the terminal arm and the x-axis). RA = \_\_\_\_\_\_\_.

1. On the diagram above, draw a related angle with a second terminal arm in the other location where cos θ is equal to a negative value.
2. The angle in standard position for this terminal arm is the other solution for θ.

### Example 3

Solve each equation below for the angle θ such that $0^{o}\leq θ\leq 360^{0}.$

a) $sin θ=0.8$ b) $cos θ= 0.3$ c) $tan θ=0.6$ d) $tan θ=-0.2$