## Analytic Trigonometry Unit 05 Readings:

## Inverse Trig Functions, Circuit Analysis, Area of a Triangle

**Inverse Functions**

Inverse trig functions (arc-functions):

sin-1 x = *θ* or asin x = *θ* or arcsin x = *θ*  for x = sin *θ*

 (Ditto for cos, tan, cot, sec and csc)

These are used to solve for the angle *θ* given the value of the trig function

They "undo" the trig function

NOTE: These are not the reciprocal trig functions:

y = (sin *θ* ) -1 = 1/sin *θ* = csc *θ*

The inverse trig functions can be found on scientific calculators by pressing the 2nd followed by

the appropriate function key

**Circuit Analysis**

An RC circuit contains both resistors and capacitors

When a sinusoidal (sine-shaped) voltage is applied to an RC circuit, each resulting voltage

drop and the current in the circuit are also sinusoidal

The frequencies (periods) are all the same

The amplitudes of the voltage and current depend on the values of the resistance and

capacitive reactance

The current and resistor voltage are in phase with each other

The capacitance causes a phase shift between the voltage and current that depends on the

relative values of the resistance and capacitive resistance

When a circuit is purely resistive, the phase angle between the source voltage and the total

current is zero

When a circuit is purely capacitive, the phase angle between the source voltage and the total

current is 90° with the current leading the voltage

When there is a combination of both resistance and capacitive reactance in a circuit, the phase

angle is somewhere between zero and 90° depending on the relative values of the

resistance and the capacitive reactance

**Impedance** is the total opposition to the sinusoidal current

- symbolized by "Z"

- measured in ohms Ω

Because resistance and capacitive reactance are 90° apart, their angle of intersection forms a

right angle, so the magnitude of the impedance can be viewed as the hypotenuse of a right triangle

 The resistance R is one side

 The capacitive reactance Xc is another side

These are shown in an impedance triangle:

For a series RC circuit, using the Pythagorean Theorem:

Z = $\sqrt{R^{2}+X\_{C}^{2}}$

The value of the **phase angle** *θ* is:

*θ* = tan-1$\left(\frac{X\_{c}}{R}\right)$

But, there's a problem…your calculator will give you the “first” answer it comes up with

(this will be in quadrant I or II) but, your answer may need to be in QIII or QIV

The solution:

 When computing tan−1$\left(\frac{A}{B}\right)$, add 180° to the calculator’s answer if the denominator (B)

is negative

For parallel RC circuits,

Z = $\frac{RX\_{C}}{\sqrt{R^{2}+X\_{C}^{2}}}$

*θ* = tan-1$\left(\frac{R}{X\_{c}}\right)$

**Oblique triangles - do not have a right angle**

**Area of an Oblique Triangle :**

*b*

*c*

*θ*

$$a$$

Area =  *cb* sin *θ*

**Heron's Formula**

area of a triangle using only measurements of the sides

Area = $\sqrt{s(s-a)(s-b)(s-c)}$

*s* = (a + *b* + *c*) (half of the perimeter of the triangle)

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