**Analytic Trigonometry Unit 08 Problems**

**Hint**

sin(*θ*) = rise or . opposite .

 hypotenuse hypotenuse

cos(*θ*) = run . or . adjacent .

 hypotenuse hypotenuse

tan(*θ*) = rise or opposite

 run adjacent

cot(*θ*) = run or adjacent

 rise opposite

sec(*θ*) = hypotenuse or hypotenuse

 run adjacent

csc(*θ*) = hypotenuse or hypotenuse

 rise opposite

**Trigonometry**

 1) For the triangle shown, calculate:

a

b

1

82º

 a =

 2) For the triangle shown, calculate:

.2510

.9680

1

*θ*

 tan(*θ* ) =

**Degrees and Radians**

**Degrees to Radians** multiply degrees by: 

**Radians to Degrees** multiply radians by: 

 3) Convert 99º to radians

 4) Convert 2π/7 to degrees

**Transforming Graphs**

**150**

π

2π

-π

-2π

 **0**

 5) What is the amplitude of the graph?

**75**

 **0**

 6) What is the period of the graph?

**- 75**

a) 𝜋/2 b) 𝜋

**- 150**

c) 3𝜋/2 d) 2𝜋

e)5𝜋/2 f) 3𝜋

g) 7𝜋/2 h) 4𝜋

 7) The period of a transformed sine function is 10𝜋/3. What is the frequency?

**RC Circuit Analysis**

**Impedance**

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

**phase angle**

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

R

XC

15Ω

80Ω

~

VS

 8) Calculate the impedance of the RC circuit:

 9) Calculate the phase angle of the RC circuit:

**Area of an Oblique Triangle**

10) Calculate the area of a triangle with two sides 19 cm and 18 cm and an included

 angle of 27°

**Heron’s formula**

11) Calculate the area of a triangle with a = 4 miles, b = 7 miles, and c = 10 miles

**Law of Sines and Cosines**

$\frac{a}{sinA}$ = $\frac{b}{sinB}$ = $\frac{c}{sinC}$

or

$\frac{sinA}{a}$ = $\frac{sinB}{b}$ = $\frac{sinC}{c}$

Note: not drawn

 to scale

A

B

C

a

b

c

12) Given C = 46º

a = 17

c = 19

 calculate angle A to the nearest degree:

13) Given a = 25

b = 30

A = 53º

 Calculate if there is:

a) One triangle b) Two triangles c) No triangles

14) Given that C = 61º

*a*2 = *b*2 + *c*2 – 2*bc* cosA *or* A = cos-1((a2-b2-c2)/(-2bc))

*or*

*b*2 = *a*2 + *c*2 – 2*ac* cosB *or* B = cos-1((b2-a2-c2)/(-2ac))

*or*

*c*2 = *a*2 + *b*2 – 2*ab* cosC *or* C = cos-1((c2-a2-b2)/(-2ab))

a = 15

b = 20

 What is angle A?

**Complex Numbers**

15) *i* equals:

1. $\sqrt{-1}$b) 0 c) –1 d) unknown, it’s a variable

16) *i* 5 equals:

a) *i* b) – *i* c) 1 d) –1

17) The impedance in one component of an AC series circuit is z1 = 8 – *j*·3 ohms, and the

 impedance in another component of the circuit is z2 = 2 + *j*·4 ohms. The total impedance

 zT for a series circuit is the sum of the impedances for its individual components:

zT = z1 + z2

 Calculate the impedance in this circuit:

18) Complex numbers are used in electronics to describe the current in an AC circuit

Ohm's law relates the current in a circuit *Ɪ* in amperes, the voltage of a circuit *V* in volts

and the resistance of the circuit *R* in ohms by the formula:

*V* = *I R*

 Calculate *V*, the voltage of a circuit, if *I* = (1 + *j*·2) amperes and *R* = (9 – *j*·3) ohms:

**Polar to Rectangular Coordinates**

19) When plotted on the rectangular coordinate system, in which quadrant would the point be

 located for the polar coordinate (3, –2π/3) ?

a) I b) II c) III d) IV

20) The rectangular coordinates for the polar coordinate (6, 2π) are:

**Polar to Rectangular**

For point P = (r,*θ*)

x = r cos*θ*

y = r sin*θ*

a) (0, 6) b) (0, -6) c) (6, 0) d) (-6,0)

21) The polar coordinates (6, 5π/4) and (6,13π/4) are the same point:

a) True b) False

**Rectangular to Polar Coordinates**

22) The polar coordinates for the rectangular coordinate (,1) are:

## Rectangular to Polar

*r* = 

*θ* = arctan *y*/*x*

a) (,4.178) b) (, 0.615)

c) (-, 2.095) d) (2, 0.609)

**Rectangular Form of Polar Equations**

**Rectangular Form**

From:

z = r(cos*θ + i* sin*θ*)

To a+b*i* where

a = r cos*θ*

b = r sin*θ*

23) Calculate the rectangular form of z = 8(cos π/2 + *i* sin π/2)

a) 8 + 8*i* b) 8 c) 8*i*  d) – 8*i*

24) Calculate the rectangular form of z = 7(cos(3π/2) + *i* sin (3π/2))

a) 7 + 7*i* b) 7 c) 7*i*  d) –7*i*

**Polar Form of Complex Equations**

25) Calculate the polar form of: 3$\sqrt{2}$ – 3$\sqrt{2}$*i*

**Polar Form**

From: a + b*i*

To: z = r (cos θ + i sin θ)

where r = $\sqrt{a^{2}+b^{2}}$ and θ = arctan(b/a)

a) 3(cos (7π/4) + *i* sin (7π/4))

b) 6(cos (5π/4) + *i* sin (5π/4))

c) 6(cos (7π/4) + *i* sin (7π/4))

d) 6(cos (7π/4) – *i* sin (7π/4))

26) Calculate the polar form of: $\sqrt{3}$ – $\sqrt{3}$ *i*

a) 3 (cos π/4 + *i* sin π/4) b) $\sqrt{6}$ (cos 7*π*/4 – *i* sin 7π/4)

c) 6 (cos 7π/4 + *i* sin 7π/4) d) $\sqrt{6}$ (cos 7π/4 + *i* sin 7π/4)

**Absolute Value of a Complex Number**

**Absolute Value of**

**a Complex Number**

|a + b*i*| =

27) Calculate the absolute value of the complex number z = 3 + 4*i*

a) – $\sqrt{29}$ b) $\sqrt{29}$ c) 5 d) –5

**DeMoivre's Theorem**

**Power of a**

**Complex Number**

z n = [ *r* (cos *θ* + *i* sin *θ*)] n =

*r* n(cos n*θ* + *i* sin n*θ*)

for n>0

28) Use DeMoivre's Theorem to calculate z = (3 + *i* )3

a) – 18 + 26*i* b) 18 – 26*i*

c) – 18 – 26*i* d) 18 + 26*i*

**Extra Credit**

Calculate the power of the following complex number: z =($\sqrt{2}$ – *i* )4

a) 7 – 4*i* b) –7 – $\sqrt{2}$*i*

c) –7 – 4$\sqrt{2}$*i* d) 7 – 4$\sqrt{2}$*i*