Question #1:

The transformation formulas between Cartesian coordinates (x,y) and polar coordinates (r,θ) are as follows:

x = rcos(θ) y = rsin(θ)

r = sqrt(x2 + y2) tan(θ) = y/x, where you have to determine which quadrant θ is in.

Every θ has a reference angle α as defined on pp.721-722, 747 in the book.

r is always positive. x and y can be either positive or negative.

For the following 5 cases, find the unknown quantities and draw the appropriate triangles, clearly labeling x, y, r, θ, and α. Round any numbers to 2 decimal places.

1. If r = 5 and θ = 3π/4, find and label x, y, and α.
2. If x = 3 and y = 4, find and label r, θ, and α.
3. If x = 3 and y = -4, find and label r, θ, and α.
4. If x = -3 and y = 4, find and label r, θ, and α.
5. If x = -3 and y = -4, find and label r, θ, and α.

Question #2:

Verify the following trigonometric identity by using trigonometric identities on the right hand side of the equation. Hint: remember the math student’s pick up line. Hi, I’m sine squared. If you’re cosine squared, then we can be one for a date tonight!

sin2(x) = [ 1 – cos(2x) ]/2

Question #3:

Given the following triangle. Let hyp =12 and θ = 60 deg.

1. What is β?
2. What is x (adj)?
3. What is y (opp)?
4. What is the value of cos(β)?
5. What is the value of the reference angle α that corresponds to θ?



Question #4:

Solve: 2sin(2x) = 1

1. What are the 2 values that (2x) can have?
2. Draw the unit circle with the 2 triangles which correspond to your answers in (1). Clearly mark each of your (2x) angles in your figure.
3. What are the 4 values that x can have?

Question #5:

Given the following triangle. Let hyp = 5 and θ = 210 deg.

1. Draw the reference angle α.
2. What is the value of α?
3. Find β.
4. Find x.
5. Find y.
6. What is the value of tan(θ)?



Question #6:

1. Let sin(α) = cos(α+β). Expand cos(α+β) with the appropriate trigonometric angle addition formula and find a value for β.
2. Let cos(α) = sin(α+β). Expand sin(α+β) with the appropriate trigonometric angle addition formula and find a value for β.

Question #7:

Find the value of z = tan(θ), where θ = arcos(4/5) or z = tan[ arcos(4/5)].

1. Draw a circle and then the reference triangle (i.e. θ = α) with adj (or x) = 4, hyp (or r) = 5, and opp (or y) positive.
2. What is the value of α?
3. arccos is a double value function for [0,360). Draw the 2nd triangle (i.e. θ not equal to α) with opp (or y) negative.
4. If θ = arcos(4/5), then what are the 2 values of θ?
5. What are the 2 values of z?

Question #8:

Two sinusoidal functions of the same frequency, when added together or subtracted from each other, will produce a single sinusoidal function of that same frequency. The standard transformations using the angle addition formulas on p775 and p795 are:

y(t) = Acos(ωt) + Bsin(ωt)

 = Dcos(φ)cos(ωt) + Dsin(φ)sin(ωt)

 = Dcos(ωt – φ)

where D = sqrt(A2 + B2) and tan(α) = B/A, A=Dcos(φ), B=Dsin(φ)

φ = α if A > 0

φ = α + π if A < 0

φ = π/2 if A = 0 and B > 0

φ = -π/2 if A = 0 and B < 0

Given: y(t) = 12cos(2πt/12 + π/4)

1. What is the angular frequency ω? (be sure to state the units if t is time in sec)
2. What is D?
3. What is φ?
4. What is A?
5. What is B?
6. Does D = sqrt(A2 + B2)? (yes or no)
7. What is α?
8. What is the period T?
9. What is the amplitude?
10. y(t) is written in terms of radians. Re-write y(t) in terms of degrees.