AP Physics 1 & C Name: _____

Summer assignment for 2026-2027 School Year

DUE ON DAY 2 OF CLASS (Tuesday 04AUG)

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Note: Besides for the AP Physics C portion, this assignment should be a review over the math that you have already learned (and should hopefully only take at most an hour).

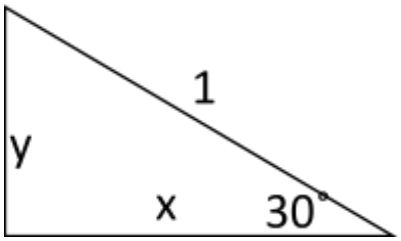
Part 1: Trigonometry Remember: SOHCAHTOA

First **write the equations** for sine, cosine, and tangent (in terms of opposite, adjacent, and hypotenuse), then complete the following questions.

$sin\,(\theta) = \frac{opposite}{hypotenuse}$ $cos\,(\theta) =$ _____ $tan\,(\theta) =$ _____

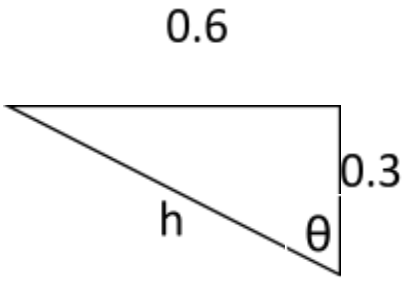
Find the numerical value(s) for the labeled side lengths and angles. Assume all triangles are right triangles. Number three is done for you as an example.

1.



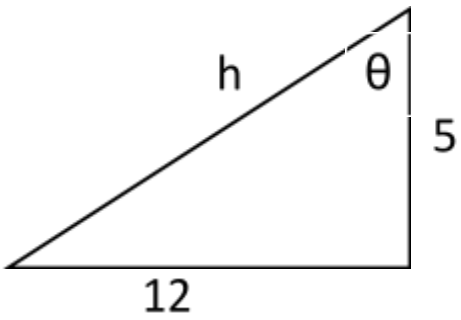
Y = X =

3.



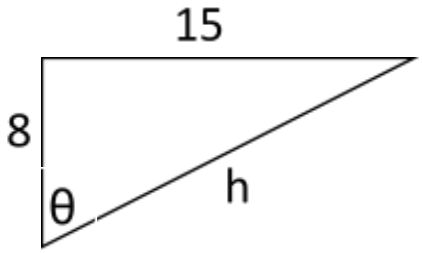
θ = 63.4° h = 0.671

2.



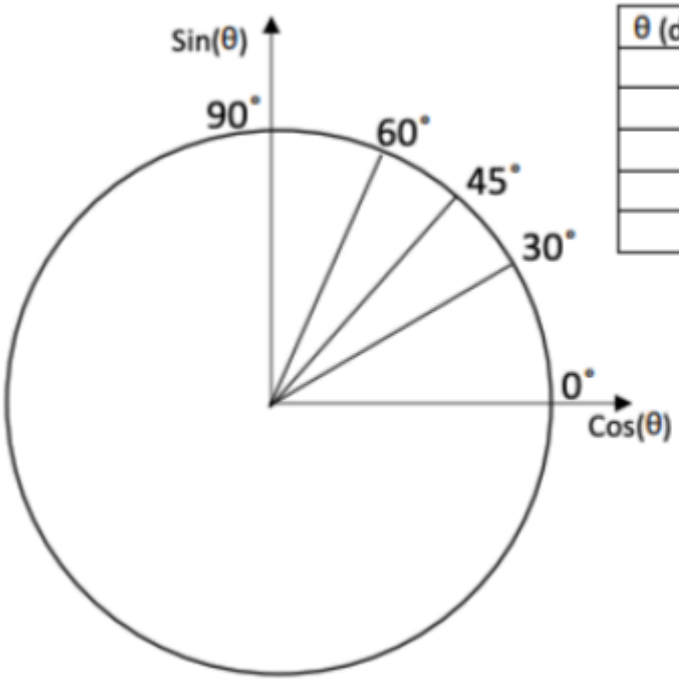
θ = h =

4.



θ = h =

Complete the table of the first quadrant of the unit circle. Then answer the following questions **about the entire unit circle** [$0^\circ \leq \theta < 360^\circ$].



θ (degrees)	θ (radians)	Sin(θ)	Cos(θ)
0°			
30°			
45°			
60°			
90°			

8. What angle(s) cause cosine to be at its maximum value?

9. What angle(s) cause sine to be at its maximum value?

10. What angle(s) cause cosine and sine to be equal to each other?

11. What angle(s) cause cosine to be at its minimum value?

12. What angle(s) cause sine to be at its minimum value?

Part 2: Vector addition & Subtraction

In AP Physics we will use vectors in our first unit onward. All vectors have a magnitude (hypotenuse) and direction (angle). To add & subtract vectors we need to follow 3 steps:

- **Decompose (break down) each vector into its horizontal (x) and vertical (y) components using trig**
- **Add or subtract the horizontal and vertical components, depending on the question**
- **Draw the resulting vector's x and y components and solve for the hypotenuse and angle of the vector**

Vector A: 5 meters long at an angle of 20 degrees North of East.

Vector B: 7 meters long at an angle of 50 degrees South of East.

Vector C: 2 meters long South.

Vector D: 10 meters long 30 degrees West of North (be careful breaking this one down).

Break down each vector into its x and y components, treating East and North as the positive directions for x and y respectively. We call this the "component form" of the vector.

Vector A: (_____, _____) Vector B: (_____, _____)

Vector C: (_____, _____) Vector D: (_____, _____)

Now solve for the following results in component form (do not find the hypotenuse and angle yet).

A + B: (_____, _____) A - C: (_____, _____)

B + D: (_____, _____) A - D: (_____, _____)

Now solve for the magnitude and direction of each of those results with respect to the horizontal direction. Use Pythagorean theorem to solve for the magnitude and trig to solve for the angle (it might be helpful to follow bullet point #3). Circle the correct two directions of the resultant vector (Ex: For #1 you should circle South & East, assuming the math was done correctly).

A + B: Magnitude = _____ meters, Direction = _____ degrees (North/South) of (East/West)

A - C: Magnitude = _____ meters, Direction = _____ degrees (North/South) of (East/West)

B + D: Magnitude = _____ meters, Direction = _____ degrees (North/South) of (East/West)

A - D: Magnitude = _____ meters, Direction = _____ degrees (North/South) of (East/West)

Part 3: Equation manipulation

Complete the following questions involving manipulating equations

Example: $V = I * R$ Solve for I $I = \frac{V}{R}$

1. $U_s = \frac{1}{2}kx^2$ Solve for x

2. $T_p = 2\pi\sqrt{\frac{l}{g}}$ Solve for l

3. $v_f = v_i + at$ Solve for t

4. $T_s = 2\pi\sqrt{\frac{m}{k}}$ Solve for k

Part 4: AP PHYS C only: Differentiation and Integration – Power rule

In AP Physics C the major calculus rule you must learn quickly is the power rule for differentiation and integration. You will not start integration in AP Calc until ~mid October but will need it in Unit 1.

$$\frac{d}{dx}\left(A * x^{n}\right) = A * n * x^{n-1}$$ Power rule for differentiation

$$\int A * x^{n} dx = A * \frac{1}{n+1} * x^{n+1} + C, \text{ where } C \text{ is a constant}$$ Power rule for integration

NOTE: A is a constant number (aka, a coefficient)

Complete the problems below. If you can do these problems confidently you should be fine when class starts. Remember to use khan academy or **reach out to me** if you have any problems.

1. Use the power rule to find the derivative of x^3?

2. Using the power rule, what is the derivative of $5x^5$?

3. Using the power rule, what is the derivative of $\frac{2}{x^3}$? (HINT: treat it as $2 * X^{-3}$)

4. What is the derivative of $-1 * \sqrt{x}$ (HINT: treat it as $-1 * X^{0.5}$)

5. Using the power rule, what is the INTEGRAL of $3x^2$?

6. What is the integral of $\mathbf{X}^{-2/3}$?

7. What is the integral of 7? (Hint, treat it as $7*x^0$)

8. What is the integral of $-2x^{-2}$?

If $\int f(x)dx = F(x)\ and\ if \int g(x) = G(x),\ then \int (f(x) + g(x))dx = F(x) + G(x)$

How to determine the integral of a polynomial function. (Note: there is only one +C, not one from each)

9. Determine $\int (3x^2 + 7)dx$

10. Determine $\int (2\sqrt{x} - \frac{1}{x^2})dx$

$\int_a^b f(x)dx = F(b) - F(a)$, where F(x) = $\int f(x)dx$

How to determine the bounded integral of f(x) (also called the 2nd fundamental theorem of calculus)

11. Determine $\int_0^3 4x^5 dx$

12. Determine $\int_0^3 (2x^2 + 7)dx$

Part 5: Checklist

Please use this checklist to keep track of which parts of the Summer Assignment you have completed. This will also serve as a guide for what to bring for the first day of class.

- Completed the Trigonometry Review
- Completed Vector Addition & Subtraction
- Completed Equation Manipulation
- AP PHYS C ONLY: Completed Differentiation and Integration - Power Rule

Be prepared for a potential Classwork/Quiz during the first week on any/all of these topics.