

PHYS 1206EL - initial test - We, September 9th 2009

Name:

Study field:

Courses taken in Math and Physics during the last two years:

1.) Please sketch a sinus function, don't forget the labels on the axis.

2.) Solve the following equations!

a) $x + 27 = 71$

b) $3y + 34 = 2y + 89$

c) $12x^2 - 36 = 108$

d) and a system:

$$a - b + 2c = 1$$

$$2a + 3c = 1$$

$$a - 3b + 4c = 2$$

Does this system have a solution? If so, describe explicitly all solutions.

Give an example of a system of two linear equations in two unknowns which has no solution.

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3.) You are taking a road trip to New York City and find the speed limits given in miles per hour. Your car only speaks km/h. What do the following limit mean.

- a) 55 miles per hour
- b) 75 miles per hour

How many liters did you put into you tank, if the gas station tells you

- a) 5 gallons
- b) 13 gallons

What are the following Fahrenheit temperatures in SI units?

- a) 75 F
- b) 34 F

4.)

$$\mathbf{x} = v_0 \mathbf{t} + \frac{1}{2} \mathbf{a} t^2$$

Show that $\mathbf{x} = v_0 \mathbf{t} + \frac{1}{2} \mathbf{a} t^2$ is dimensionally correct, assuming \mathbf{x} is a distance, \mathbf{a} is an acceleration, \mathbf{t} is time, and v_0 is velocity .

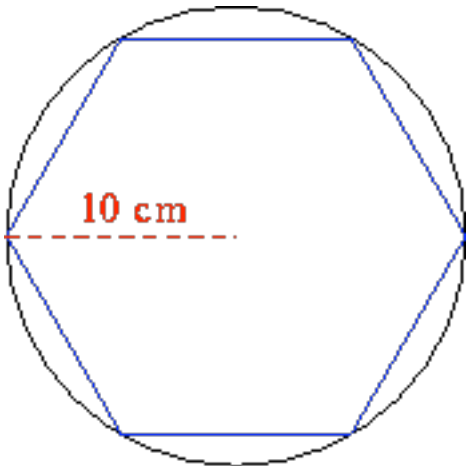
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5.) A point on a polar coordinate system is located at $r=2.0$ and $\theta = 25$ degrees.

- Find the cartesian (x and y) coordinates of the point
- Verify the solution using the Pythagorean Theorem

6.)

- An airplane is flying at 600 km per hour, heading 30 degrees North of East. What are the magnitudes of the North and East components of the velocity?
- A wind from due North starts blowing at 60 km per hour. What is the new velocity of the plane? (magnitude and direction)



7.) A hexagon is inscribed in a circle with a radius of 10 cm. How long are the hexagon's sides?

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8.) An 80 kg skydiver leaps out of an airplane at an altitude of 3000m. Assuming an initial velocity equal to zero and neglecting air resistance, what would be his speed at an altitude of 1000 m using the conservation of mechanical energy?

9.) An elevator $m=800\text{kg}$ has a maximum load of 8 people or 600kg. The elevator goes up 10 stories = 30m at a constant speed of 4m/s. What is the average power output of the elevator motor if the elevator is fully loaded with its maximum weight? (neglect friction) How much work is it for the elevator to transport 4 people 5 stories high?