Worksheet 1: Math review and 1D motion

1 Sig Figs and Scientific Notation

1.1 How many significant figures does each of the following numbers have?

a. 6.21 **3**

b. 62.1 _____

c. 6210 _____

d. 6210.0 _____

e. 0.062 _____

f. 0.620 _____

g. 0.62 _____

h. .62 _____

i. 1.062 _____

j. 6.21×10^3 _____

k. 6.21×10^{-3} _____

l. 62.1×10^3 _____

1.2 Compute the following numbers with the correct number of sig figs:

a. $33.3 \times 25.4 =$ **846**

b. $33.3 - 25.4 =$ _____

c. $33.3 \div 45.1 =$ _____

d. $2.345 \times 3.321 =$ _____

e. $(4.32 \times 1.23) - 5.1 =$ _____

f. $33.3^2 =$ _____

1.3 Express the following numbers and computed results in scientific notation

a. 9,827 $\mathbf{9.827 \times 10^3}$

b. 0.0000000550 _____

c. 3,200,000 _____

d. $32,041 \times 47 =$ _____

e. $0.059 \div 2,304 =$ _____

f. $320. \times 0.050 =$ _____

2 Algebra Review:

2.1 Simplify or solve each:

a. $\frac{10^2}{(10^3)^2}$ $\boxed{10^{-4}}$

b. $\frac{(10^2)^9}{(10^2)^{10}}$ _____

c. $\frac{(10^2)^{10}}{10^{20}}$ _____

d. $\frac{10^9}{(10^4)^2}$ _____

e. Solve for a: $y = v_0 t + \frac{1}{2}at^2$ f. Solve for g: $T = 2\pi\sqrt{\frac{L}{g}}$ g. Solve for μ :$\text{mv}^2\overline{r=\mu mg}$

2.2 Solving systems of equations

$$\text{A) } h = h_0 + v_0 t - \frac{1}{2}gt^2, \qquad \text{B)} v^2 = v_0^2 - 2gh, \qquad \text{C)} v = v_0 - gt$$

1) You are given v_0, h_0, and g and the equations above. Do you have enough equations to solve for v? Can you do it with two equations? With one? Solve for v:

2) You are given v, t, and g. Do you have enough equations to solve for h? Can you do it with two equations? With one? Solve for h:

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3 SI Units and Dimensional analysis:

3.1 Convert the following to SI units. Work across the line and show all steps in the conversion. Use scientific notation and apply the proper use of significant figures.

a. 9.12 μs $\times$ $\frac{1s}{10^6 \mu s} = \mathbf{9.12 \times 10^{-6} s}$

b. 3.42 km $\times$

c. 44 cm/ms $\times$

d. 80 km/hr $\times$

e. 8 in $\times$

f. 13 in^2 $\times$

g. 250 cm^3 $\times$

3.2 **Determine which of the following statements are *reasonable*:**

a. Joe is 180 cm tall. **1.80 m ≈ 6 ft tall, which is reasonable**

b. I rode my bike to campus at a speed of 50 m/s

c. A skier reaches the bottom of the hill going 25 m/s

d. I can throw a ball a distance of 2 km

e. I can throw a ball at a speed of 50 km/hr

3.3 **Use the following dimensions for variables to determine which equations are valid:**

$[x] = [L], \qquad [m] = [M], \qquad [v] = [L]/[T], \qquad [t] = [T], \qquad [a] = [L]/[T]^2, \qquad [A] = [L]^2,$

$$[E] = [M][L]^2/[T]^2, \qquad [F] = [M][L]/[T]^2, \qquad [p] = [M][L]/[T], \qquad [P] = [M][L]^3/[T]^2$$

$x = vt$ $\mathbf{[L]=\frac{[L]}{[T]} \cdot [T] = [L],}$ **which is *valid***

$x = \frac{1}{2}at^2$ _____

$v^2 = x + ax$ _____

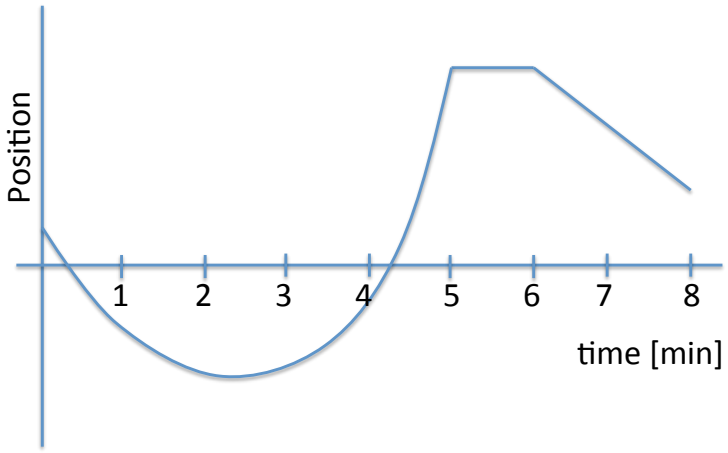
$v = at$ _____

$F = ma$ _____

$E = Fx$ _____

$E = \frac{1}{2}p^2x$ _____

4 Reading graphs



1. During what time interval is there acceleration?_____

2. During what time interval is there zero velocity? _____

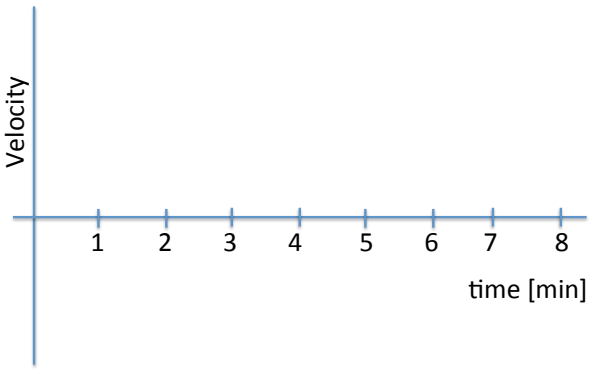
3. At what instant is velocity zero but acceleration nonzero? _____

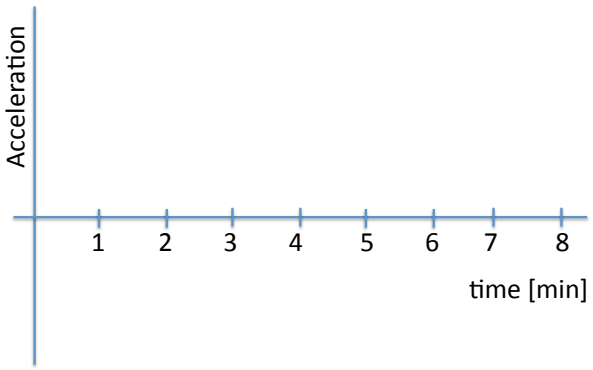
4. During what time interval is there the highest speed? _____

5. During what time interval is there slow down? _____

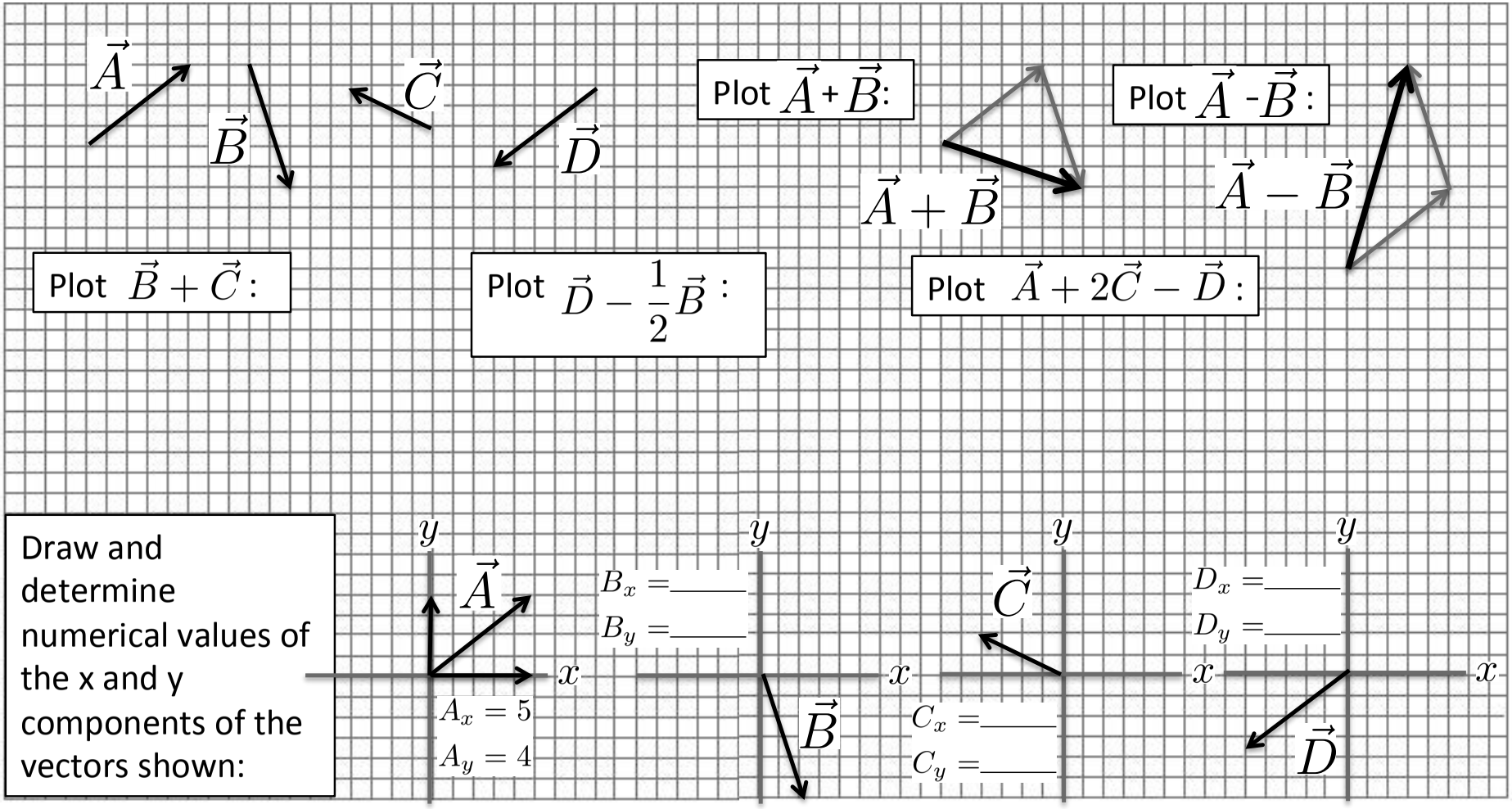
6. During what time interval is there speeding up? _____

7. Do your best to sketch graphs for velocity and acceleration



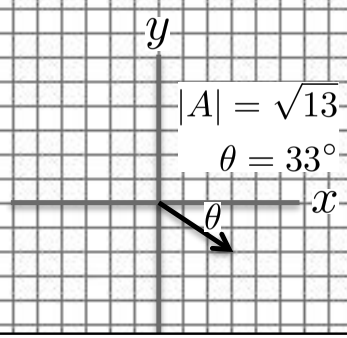


5. Vectors


$\vec{A}$
$\vec{B}$
$\vec{C}$
$\vec{D}$
Plot $\vec{A}+\vec{B}$:
$\vec{A}+\vec{B}$
Plot $\vec{A}-\vec{B}$:
$\vec{A}-\vec{B}$
Plot $\vec{B}+\vec{C}$:
Plot $\vec{D}-\frac{1}{2}\vec{B}$:
Plot $\vec{A}+2\vec{C}-\vec{D}$:
Draw and determine numerical values of the x and y components of the vectors shown:
y
x
$\vec{A}$
$A_x = 5$
$A_y = 4$
$B_x =$_____
$B_y =$_____
$\vec{B}$
$\vec{C}$
$C_x =$_____
$C_y =$_____
$D_x =$_____
$D_y =$_____
$\vec{D}$

-Draw the vector on the axes provided.
-Draw and label an angle θ to describe the direction of the vector.
-Find the magnitude and direction of the vector.

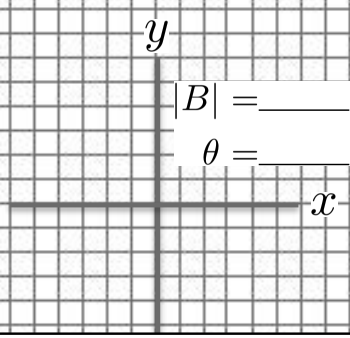
$A_x = 3, A_y = -2$



$|A| = \sqrt{13}$

$\theta = 33°$

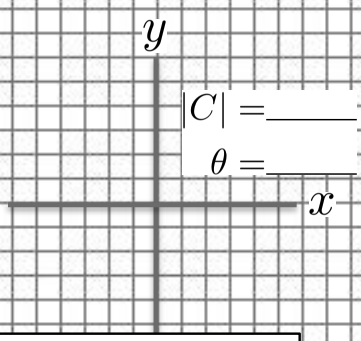
$B_x = -4, B_y = 4$



$|B| =$____

$\theta =$____

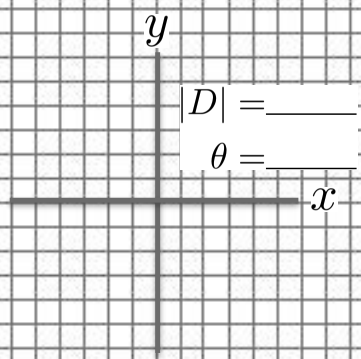
$C_x = 0, C_y = -3$



$|C| =$____

$\theta =$____

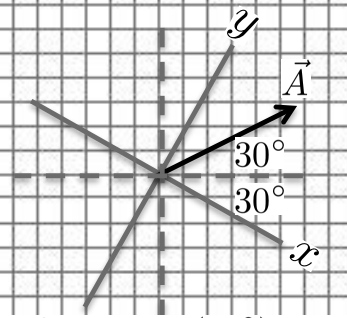
$D_x = -3, D_y = -4$



$|D| =$____

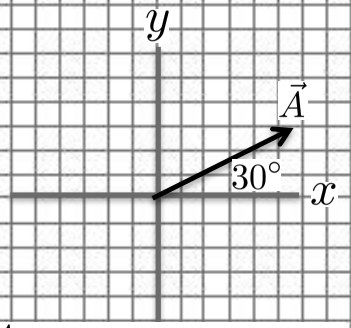
$\theta =$____

-Define vector A with magnitude=5, 30° above the horizontal.
-Determine A_x and A_y in each coordinate system.



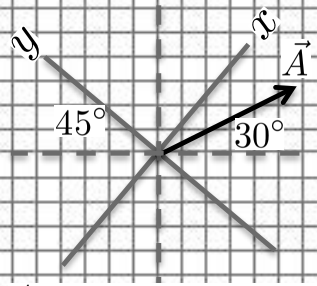
$A_x = 5\cos(60°) = 5/2$

$A_x = 5\sin(60°) = 5\sqrt{3}/2$



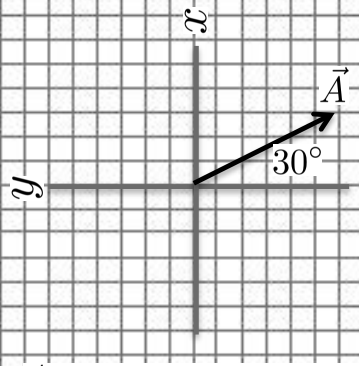
$A_x =$_____

$A_x =$_____



$A_x =$_____

$A_x =$_____



$A_x =$_____

$A_x =$_____