$$\vec{v} = \frac{d\vec{r}}{dt}$$

$$\vec{\omega} = \frac{d\vec{\theta}}{dt}$$

$$\vec{a} = \frac{d\vec{v}}{dt}$$

$$\vec{\alpha} = \frac{d\vec{\omega}}{dt}$$

$$v_{\mathrm{sf}} = v_{\mathrm{si}} + a_{\mathrm{s}}\,\Delta t$$

$$\omega_{\mathrm{f}} = \omega_{\mathrm{i}} + \alpha\,\Delta t$$

$$s_{\mathrm{f}} = s_{\mathrm{i}} + v_{\mathrm{si}}\,\Delta t + \tfrac{1}{2}a_{\mathrm{s}}\,(\Delta t)^2$$

$$\theta_{\mathrm{f}} = \theta_{\mathrm{i}} + \omega_{\mathrm{si}}\,\Delta t + \tfrac{1}{2}\alpha\,(\Delta t)^2$$

$$s = r\theta$$

$$v = r\omega$$

$$a_{\mathrm{t}} = r\alpha$$

$$\sum \vec{F} = m\vec{a} = \frac{d\vec{p}}{dt}$$

$$\sum \vec{F}_{\mathrm{ext}} = M\vec{a}_{\mathrm{cm}} = \frac{d\vec{P}}{dt}$$

$$\sum \vec{\tau}_{\mathrm{ext}} = I\vec{\alpha} = \frac{d\vec{L}}{dt}$$

$$f_{\mathrm{s,max}} = \mu_{\mathrm{s}} n$$

$$f_{\mathrm{k}} = \mu_{\mathrm{k}} n$$

$$a_{\mathrm{r}} = \frac{v^2}{r}$$

$$\vec{w} = m\vec{g}$$

$$|\vec{F}_{\mathrm{G}}| = \frac{Gm_1m_2}{|\vec{r}|^2}$$

$$D = \tfrac{1}{2}C\rho Av^2$$

$$\vec{\tau} = \vec{r} \times \vec{F}$$

$$W = \int \vec{F} \cdot d\vec{s}$$

$$W_{\mathrm{ext}} = \Delta K + \Delta U + \Delta E_{\mathrm{th}}$$

$$K = \tfrac{1}{2}mv^2$$

$$K = \tfrac{1}{2}I\omega^2$$

$$U_{\mathrm{g}} = mgy$$

$$U_{\mathrm{s}} = \tfrac{1}{2}k\,(\Delta s)^2$$

$$U_{\mathrm{G}} = -\frac{Gm_1m_2}{r}$$

$$P = \frac{dE_{\mathrm{sys}}}{dt}$$

$$P = \vec{F} \cdot \vec{v}$$

$$\vec{J} = \int \vec{F}\,dt = \Delta\vec{p}$$

$$\vec{p} = m\vec{v}$$

$$\vec{r}_{\mathrm{cm}} = \frac{\sum \vec{r}_i m_i}{\sum m_i}$$

$$\vec{r}_{\mathrm{cm}} = \frac{\int \vec{r}\,dm}{\int dm}$$

$$I = \sum m_i r_i^2$$

$$I = \int r^2\,dm$$

$$I = I_{\mathrm{cm}} + Md^2$$

$$\vec{L} = \vec{r} \times \vec{p}$$

$$\vec{L} = I\vec{\omega}$$

$$x = A\cos(\omega t + \phi_0)$$

$$\vec{a}_{\mathrm{x}} = -\omega^2\vec{x}$$

$$\omega = \sqrt{k/m}$$

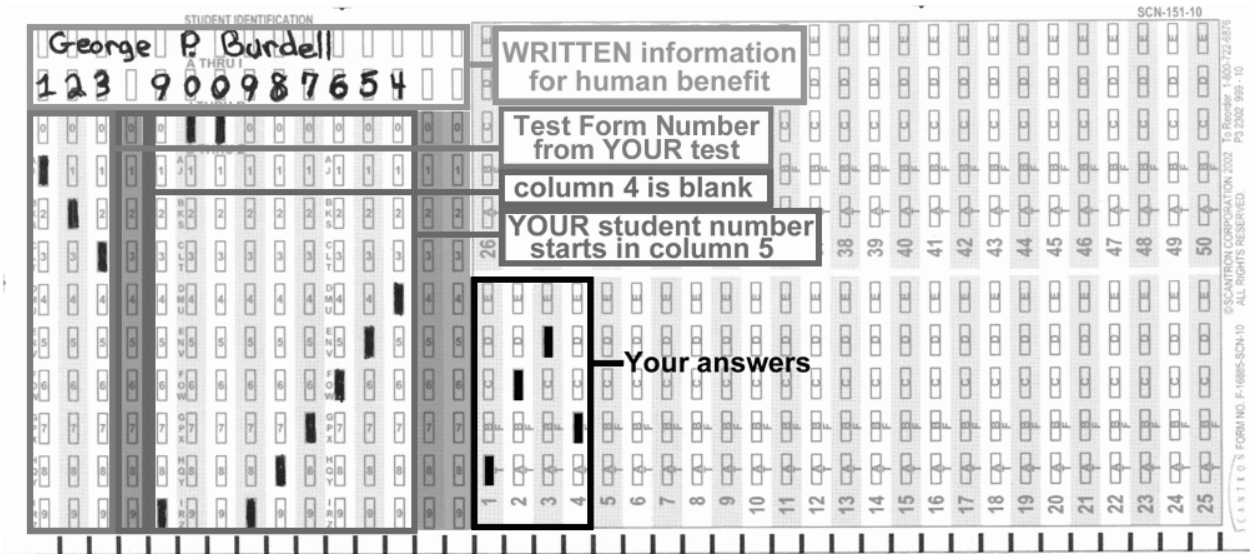
$$\omega = 2\pi f = \frac{2\pi}{T}$$

Physical Constants:

Gravitational Acceleration at Earth's Surface $g = 9.81\,\mathrm{m/s^2}$

Unless otherwise directed, drag is to be neglected and all problems take place on Earth.

Please remove this sheet from your Quiz or Exam



YOUR form number is **115**

Recitation Sections

	Clough 125	Clough 127	Clough 131	Clough 325
Monday				
2:05 – 2:55 pm	B01 Gaire, Vinod	B05 Roberts, Kelli		A07 Whitley, Lee
3:05 – 3:55 pm	B02 Gaire, Vinod	C02 Roberts, Kelli		
4:05 – 4:55 pm	B06 Gaire, Vinod	B09 Pallantla, Ravi Kumar	C01 Biewer, John	
Tuesday				
2:05 – 2:55 pm	C03 Gaire, Vinod			
3:05 – 3:55 pm	B04 Gaire, Vinod		C04 Cowan, Erika	
4:05 – 4:55 pm	B03 Gaire, Vinod		A01 Cowan, Erika	
5:05 – 5:55 pm	A02 Cowan, Erika			
Wednesday				
2:05 – 2:55 pm				A03 Kim, Sirwoo
3:05 – 3:55 pm	C05 Kim, Sirwoo			
4:05 – 4:55 pm	C06 Kim, Sirwoo			A04 Biewer, John
Thursday				
2:05 – 2:55 pm	A05 Pallantla, Ravi Kumar			B07 Whitley, Lee
3:05 – 3:55 pm	C08 Pallantla, Ravi Kumar			
4:05 – 4:55 pm	C07 Pallantla, Ravi Kumar			B08 Cowan, Erika
5:05 – 5:55 pm	C10 Cowan, Erika			
6:05 – 6:55 pm	A06 Cowan, Erika	C09 Pallantla, Ravi Kumar		
7:05 – 7:55 pm				

Version A

Quiz #1 Form #115

Physics 2211 ABC Spring 2017

Name:_____

Recitation Section:_____

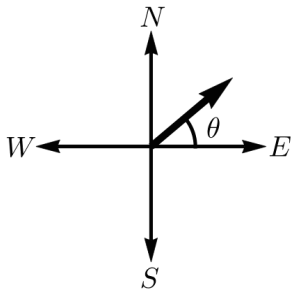
- Print your name, quiz form number (3 digits at the top of this form), and student number (9 digit Georgia Tech ID number) in the section of the answer card labeled "Student Identification."
- Bubble the Quiz Form Number in columns 1–3, skip column 4, then bubble your Student Number in columns 5–13.
- Free-response questions are numbered I–III. For each, make no marks and leave no space on your card. Show all your work clearly, including all steps and logic. Box your answer.
- Multiple-choice questions are numbered 1–7. For each, select the answer most nearly correct, circle this answer on your quiz, and bubble it on your answer card. Do not put any extra marks on the card.
- Turn in your quiz and answer card as you leave. Your score will be posted when your quiz has been graded. Quiz grades become final when the next quiz is given.
- You may use a calculator that cannot store letters, but no other aids or electronic devices.

I. (16 points) A rocket-powered car moves along a line, starting from rest and accelerating horizontally with an acceleration a that depends on time t according to

$$a(t) = \left(-12\,\mathrm{m/s^4}\right) t^2 + \left(48\,\mathrm{m/s^3}\right) t$$

until the acceleration reaches zero. After that point the car cruises at a constant speed. What is that speed?

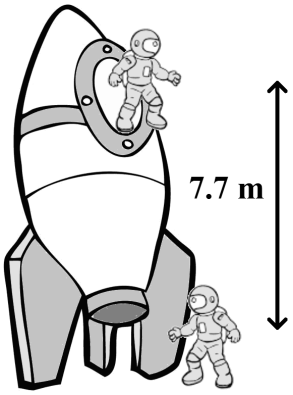
II. (16 points) Some scientists are exploring Mars. Their rover is at Checkpoint A, 6.5 miles east and 4.6 miles north of their settlement. From that Checkpoint, they begin heading 45° north of east to collect more samples. After they have gone 1.5 miles, they realize that they only have enough fuel remaining to travel 8.2 miles. They turn their rover around and head directly towards the settlement. How far from camp are they when they run out of fuel?



1. (6 points) At what angle (measured North of East) must they to drive to get back?

   (a) 218°
   (b) 38°
   (c) 52°
   (d) 322°
   (e) 142°

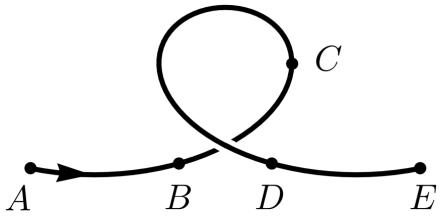
III. (16 points) An astronaut on Venus throws a geologic sample straight up to her companion in the ship 7.7 m above her. The companion misses the sample on its way up, but catches it on its way down. If the sample is thrown at 11.9 m/s, and is traveling at 2.3 m/s when caught, how much time elapses between the throw and the catch? (*NOT on Earth!*)



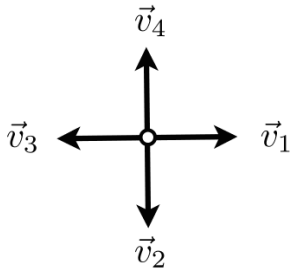
2. (6 points) If the astronaut in the spaceship now wants to throw a box of plastic bags down to the astronaut on the surface of Venus, with what initial velocity should they throw the box so that they will have a speed of 11.9 m/s when the astronaut on the ground catches them?

   (a) It is impossible for the bundle to be traveling at 11.9 m/s when caught.
   (b) They must throw them down at 2.3 m/s.
   (c) They must throw them up at 2.3 m/s.
   (d) They could drop them from rest.
   (e) They could throw them up or down at 2.3 m/s.

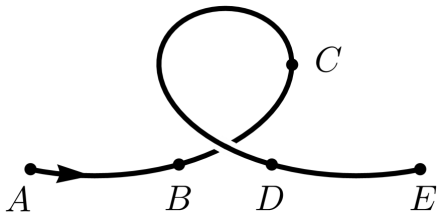
3. (8 points) A bee flies at constant speed from point A to point E along the path shown at the right. Which of the vectors below best corresponds to the direction of the average *velocity* between the points A and D?



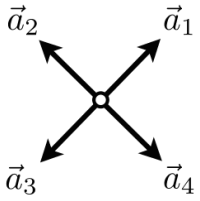
(a) $\vec{v}_2$
(b) $\vec{v}_1$
(c) $\vec{v}_4$
(d) No direction, as magnitude is zero.
(e) $\vec{v}_3$



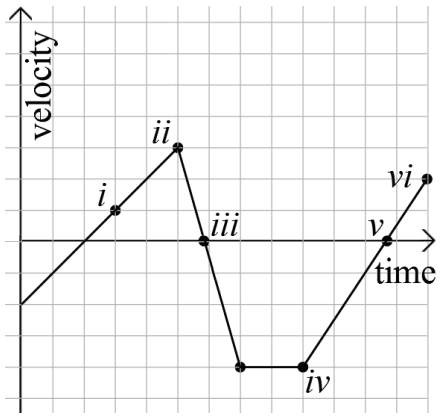
4. (8 points) A bee flies at constant speed from point A to point E along the path shown at the right. Which of the vectors below best corresponds to the direction of the average *acceleration* between the points B and C?



(a) $\vec{a}_1$
(b) No direction, as magnitude is zero.
(c) $\vec{a}_3$
(d) $\vec{a}_4$
(e) $\vec{a}_2$

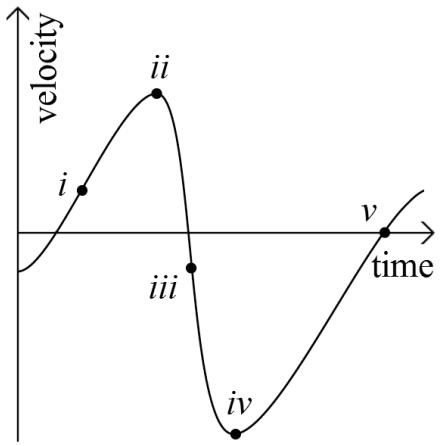


5. (8 points) An object moves with a velocity that varies with time as shown. It passes the origin at the point i. At what point is it farthest from the origin?



(a) At vi.
(b) At ii.
(c) At iv.
(d) At v.
(e) At iii.

6. (8 points) An object moves on a non-linear spring such that its velocity varies with time as shown. At what point is the magnitude of acceleration the greatest?



(a) At v.
(b) At iv.
(c) At ii.
(d) At iii.
(e) At i.

7. (8 points) A rubber ball is dropped and bounces from the floor. A motion diagram shows the ball released from rest at time 1, and in contact with the floor at time 4. Note that the diagram for upward motion has been offset for clarity. At which time(s), if any, does the average acceleration have the greatest magnitude?

(a) At times 2 and 6.
(b) At times 3 and 5.
(c) At time 4.
(d) The acceleration is the same at all times.
(e) At times 1 and 7.