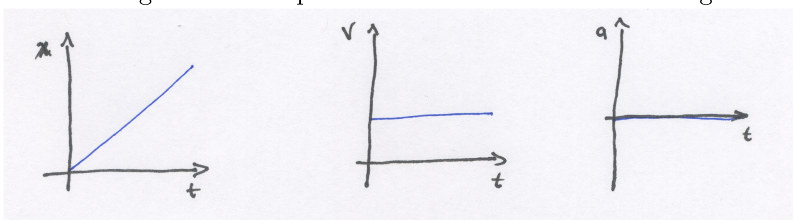
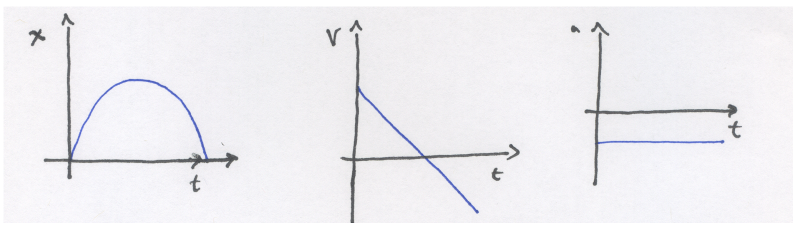
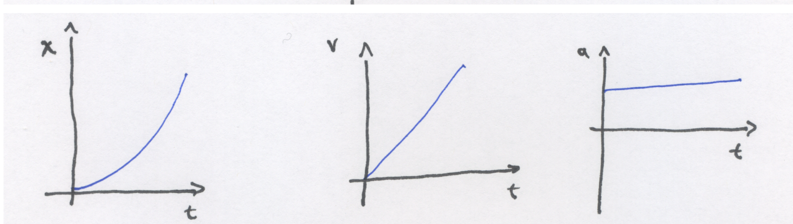
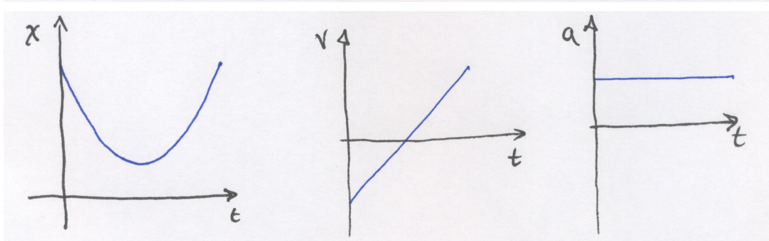
1. Clicker Questions from Class:

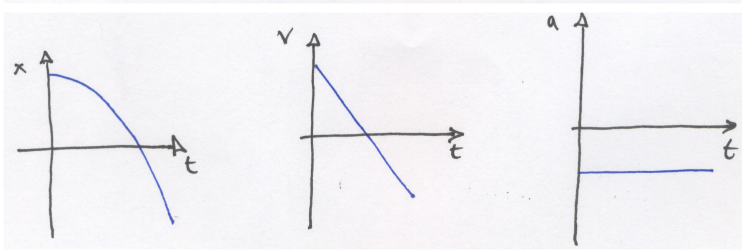
(1) Which set of diagrams best represents the motion of a ball rolling on a level table?

(a) 

(b) 

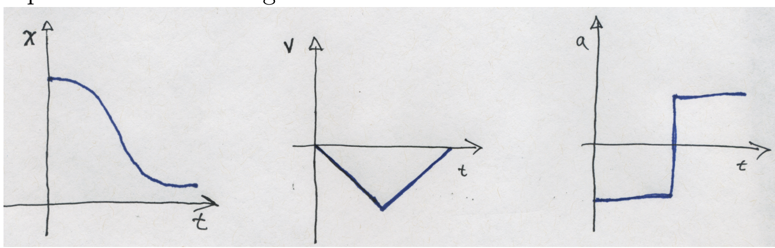
(c) 

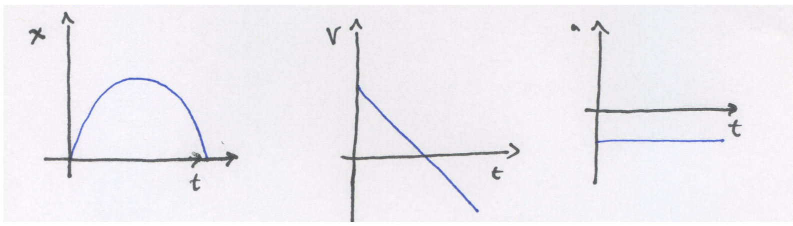
(d) 

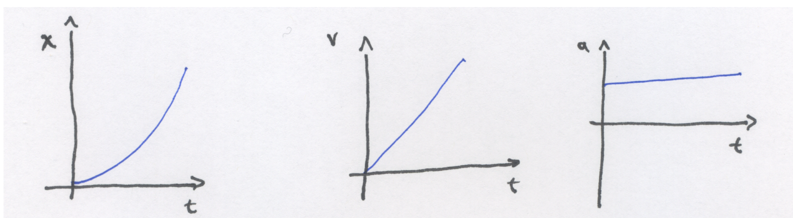
(e) 

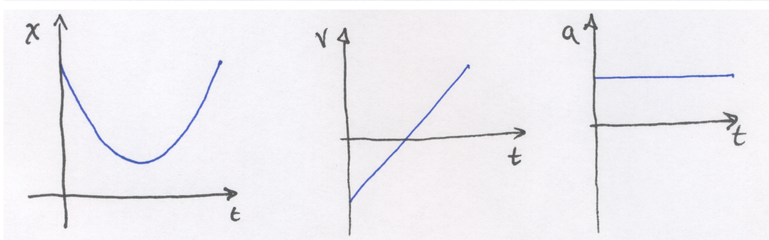
(2) In the demonstration, when the glider starts with velocity up the track, does the acceleration ever go to zero?
   (a) Yes
   (b) No

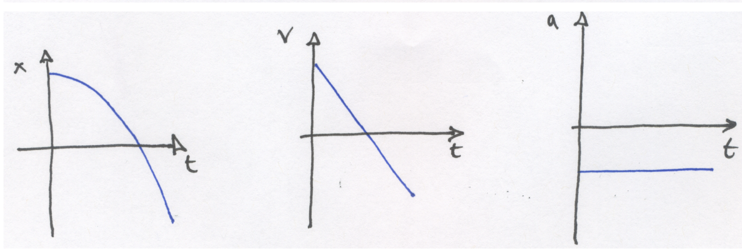
(3) In the demonstration, when the glider starts with velocity up the track, which set of diagrams best represents the resulting motion?

(a) 

(b) 

(c) 

(d) 

(e) 

(4) A whale of mass m enjoys a force of F for a time interval of T, giving a final speed of v_f - Wheeee! If the **same** force acts for the **same** interval of time on **two** identical whales, each of mass m, what will the final speed of the pair be?

(a) $4v_f$
(b) $2v_f$
(c) v_f
(d) $\frac{1}{2}v_f$
(e) $\frac{1}{4}v_f$

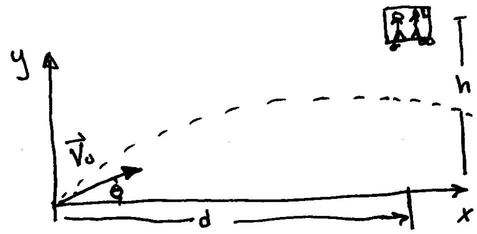
(5) In an inertial reference frame, a copy of HRW rests on a table. You push directly down on the top of the book. What is relationship between the normal force and the gravitational force?
(a) $N > mg$
(b) $N = mg$ since it is always equal to the weight
(c) $N < mg$ but not zero
(d) $N = 0$

(6) A crate of cider mill donuts of mass m rests on the floor of an elevator that is moving upward at a constant velocity. What is the relationship between the gravitational force and the normal force?
(a) $N > mg$
(b) $N = mg$
(c) $N < mg$ but not zero
(d) $N = 0$

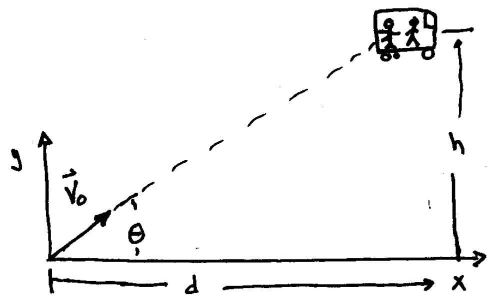
(7) A crate of cider mill donuts of mass m rests on the floor of an elevator accelerating upward at $a = 9.8$ m/s^2. What is the relationship between the gravitational force and the normal force?
(a) $N = \frac{1}{2}mg$
(b) $N = 0$
(c) $N = mg$
(d) $N = 2mg$
(e) None of the above

(8) An airplane travels 130 miles on a straight course of 45^o (east of due north). How far north (y-direction) and how far east (x-direction) did the plane travel from its starting point?
(a) 120 miles north and 50 miles east
(b) 50 miles north and 120 miles east
(c) 100 miles north and 80 miles east
(d) 80 miles north and 100 miles east
(e) 92 miles north and 92 miles east

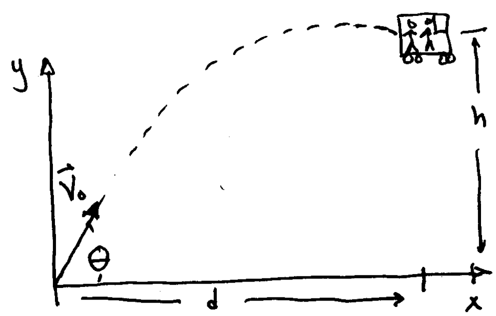
(9) The band "The Monkees" hang from an electromagnet. You fire off fan mail in the form of a ball, in an attempt to catch the band on the way out of town. It is aimed directly at the band. The sketch of the situation looks like this



(a)



(b)



(c)

(d) none of the above

(10) The band "The Monkees" hang from an electromagnet. You fire off fan mail in the form of a ball, in an attempt to catch the band on the way out of town. It is aimed directly at the band. When you fire off the ball, the band drops away in free fall. Does your ball catch the band?
(a) nope
(b) yep
(c) depends on ...
(d) it is simply not possible to determine the answer.

(11) On an excessively hot summer day you hope to hit your friend with a water balloon. Your friend sits on a window sill directly across the street from where you are. You aim directly at your friend and toss the balloon. Is your friend gratefully cool?
(a) nope
(b) yep
(c) depends on ...
(d) it is simply not possible to determine the answer.

(12) On an excessively hot summer day you hope to hit your friend with a water balloon. Your friend sits on a window sill directly across the street from where you are. You aim directly at your friend and toss the balloon. As you toss the balloon your friend drops from the window. Is your friend gratefully cool?

(a) nope
(b) yep
(c) depends on ...
(d) it is simply not possible to determine the answer.

(13) An apple sits upon the poor offspring of William Tell, who stands 60.0 m away. William Tell launches his arrows at $|\mathbf{v_o}| = 53.0$ m/s. At what angle must William Tell launch the arrow so that it passes through the center of the apple? Assume that the arrow's launch point is the same height as the center of the apple.

(a) 45^o
(b) 12^o
(c) 4.2^o
(d) 6.2^o
(e) 6.0^o

(14) If the apple is 10.1 cm tall in the above example and if William Tell has an angular uncertainty of 0.1^o, then what happens?

(a) all is well still
(b) disaster!
(c) can't tell

(15) Do uncertainties matter?

(a) Surely.
(b) No, just be precise.

(16) In uniform circular motion where does the acceleration point?

(a) Along the direction of motion since that's where its is going, in the $\hat{\theta}$ direction.
(b) Away from the origin since that is the direction of the change in velocity, in the $\hat{r}$ direction.
(c) It changes direction as it goes around so there is no direction to it.
(d) Towards the origin since that is the direction of the change in velocity, in the $-\hat{r}$ direction.
(e) Towards where it came from since the velocity vector bends backward, in the $-\hat{\theta}$ direction.

(17) If the string is suddenly cut what would happen to the ball?

(a) It accelerates outwards so the trajectory curves outward from the point where the string was cut
(b) It continues at a constant velocity along the line it was traveling.
(c) It follows the circle for awhile before drifting outward.
(d) It falls inward, reaching the middle in some time.
(e) It accelerates straight ahead and heads away from the center of the circle.

(18) With gravity on, a ball orbits in a horizontal circle with uniform circular motion. At what angle θ to we find the ball?

(a)
$$\tan\theta = \frac{v^2}{gr}$$

(b)
$$mg\sin\theta = T$$

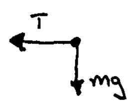
(c)
$$\tan\theta = \frac{mg}{T}$$

(d)
$$\tan\theta = \frac{gr}{v^2}$$

(e) The angle can't be determined from this information.

(19) For the lowest point for the ball orbiting in a vertical circle, what is the FBD?

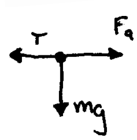
(a)



(b)

(c)

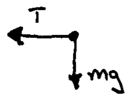
(d)



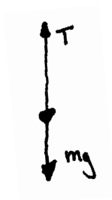
(e)

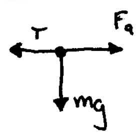
(20) For the right most point of the orbit in a vertical circle, what is the FBD?

(a)

(b) 

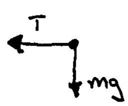
(c) 

(d) 

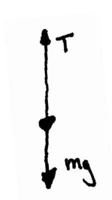
(e) 

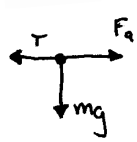
(21) For the car at the highest point on the loop, what is the FBD?

(a) 

(b) 

(c) 

(d) 

(e) 

(22) From what height should we start the car, if it is going to complete the loop at the minimum speed? The radius is 13 cm. What *minimum* speed does the FBD give us?
   (a) From $F = ma$ we have $v = \sqrt{gR^2}$.
   (b) From $F = ma$ we have $v = \sqrt{gR}$.
   (c) From $F = ma$ we have, er a normal force in the way...
   (d) From $F = ma$ we have $v = \sqrt{2gR}$.
   (e) none of the above

(23) From what height should we start the car, if it is going to complete the loop at the minimum speed? The radius is 13 cm. FIRST - How do we solve this?
   (a) $F = ma$ at the top and we're done
   (b) $F = ma$ at the top and then conservation of energy
   (c) $F = ma$ at the top, conservation of energy, and then find the speed
   (d) $F = ma$ at the top, conservation of energy, and then solve for the height
   (e) none of the above

(24) From what height (from the table) should we start the car, if it is going to complete the loop at the minimum speed? The radius is 13 cm. NOW - what is the number?
   (a) at least 21 cm
   (b) at least 33 cm
   (c) at least 42 cm
   (d) at least 48 cm
   (e) none of the above - here's the correct number!

(25) A particle is released from rest at point P, what happens?
   (a) It coasts at constant velocity to the right.
   (b) It coasts at constant velocity to the left.
   (c) It accelerates to the right.
   (d) It accelerates to the left.
   (e) It is not possible to determine from $U(x)$ alone.

(26) What is the speed at $x = 3.0$m?
   (a) 2.8 m/s
   (b) 4.5 m/s
   (c) 2.1 m/s
   (d) 4.4 m/s
   (e) 10.5 m/s

(27) Where's the center of mass?
   (a) in a band around the net
   (b) in the middle of the net, where there is little or no mass
   (c) in the handle
   (d) none of the above

(28) What path will the center of mass take?
   (a) a horizontal line
   (b) an concave down exponential
   (c) it will be a wiggly-bendy path going up then down
   (d) it acts as a single particle the path is a parabola
   (e) none of the above

(29) What path did the center of mass take?
  (a) a horizontal line
  (b) an concave down exponential
  (c) it will be a wiggly-bendy path going up then down
  (d) it acts as a single particle the path is a parabola
  (e) none of the above

(30) What path did the red light on the end take?
  (a) a horizontal line
  (b) an concave down exponential
  (c) it will be a wiggly-bendy path going up then down
  (d) it acts as a single particle the path is a parabola
  (e) none of the above

(31) What is the point of all the insulation?
  (a) to decrease the impulse
  (b) to decrease the amount of time of the collision and thus decrease the acceleration
  (c) to increase the amount of time of the collision and thus increase the acceleration
  (d) to decrease the acceleration on impact
  (e) to increase the impulse

(32) Which mass reaches the bottom first?
  (a) The solid cylinder
  (b) The hollow cylinder
  (c) They arrive at essentially the same time
  (d) None of the above

(33) For the ball rolling on the track the "safe launch height" is:
  (a)
$$\frac{5}{2}R \text{ as before}$$
  (b) Higher
  (c) Lower
  (d) Wait! Let's compute this thing.

(34) Balanced on its end, the ladder or meter stick, will fall over and hit the ground.
  (a) Yup, no question about that!
  (b) Nope. There's another torque from the friction on the ground that saves the day.
  (c) Wait I can't solve this one.

(35) Balanced on the edge of high cliff (or low stair) you, given a little push (and this some torque), will fall
  (a) Yup, no question about that!
  (b) Nope. There's another torque from the friction on the ground that saves the day.
  (c) Wait I can't solve this one.
  (d) Nope. Unlike the meter stick, we can change our moment of inertia
  (e) Yup, given any push we're over the edge.

(36) What happens when you pull the masses in?
  (a) Nothing - you will rotate at the same angular velocity.
  (b) You will slow down.

(c) You will speed up.
(d) You will go the other way round.
(e) You might fall over.

(37) What happens when the wheel is turned over?
(a) You and the wheel rotate with $\vec{\omega}$ pointing UP.
(b) You and the wheel rotate with $\vec{\omega}$ pointing DOWN.
(c) Nothing since there is an external torque.
(d) Nothing since there are no external torques.
(e) Let's see!

(38) What happens when the wheel is held at one end?
(a) It rotates with $\vec{\Omega}$ pointing UP.
(b) It rotates with $\vec{\Omega}$ pointing DOWN.
(c) Nothing since there is an external torque.
(d) Nothing since there are no external torques.
(e) Help!

(39) A bicycle wheel is suspended from one end of the axel. As the angular momentum decreases due to friction in the bearing, the "precession period" - the time to go around once - must
(a) decrease since it is proportional to ℓ.
(b) increase since it is inversely proportional to ℓ.
(c) remain constant because angular momentum around the vertical axis is conserved.
(d) be constant since there is no relation between these quantities.
(e) er, can we do the experiment again?

(40) For the suspended beam example, what happens if the hinge is replaced by frictional force? The minimum coefficient of static friction is
(a) given by $\mu_s = \tan\theta$.
(b) given by

$$\mu_s = \frac{1}{\tan\theta}$$

(c) given by another expression.
(d) not possible to find.

(41) When lifted out of the glass, the pressure at the top of the straw is
(a) higher than atmospheric pressure so it can hold in the water
(b) lower than atmospheric pressure
(c) the same as atmospheric pressure

(42) When the tube of the water barometer rises higher than 10 m then the level of the fluid will
(a) drop
(b) stay the same
(c) lift
(d) - we cannot determine this from the information given!

(43) What was the payload for Trappe's trans-Atlantic quest?
(a) 500 kg
(b) 2.2×10^3 kg
(c) 3.1×10^3 kg

(d) 16×10^3 kg
(e) none of the above

(44) As the air blows across the top of the tube
(a) nothing will happen
(b) air will be forced into the tube, increasing the pressure, and the water level will drop
(c) the pressure in the tube will drop due to energy conservation and water will come out
(d) none of the above

(45) The ball stays near the jet of air due to
(a) momentum conservation
(b) angular momentum conservation
(c) $F = ma$
(d) energy conservation
(e) none of the above

(46) The sheets of paper will
(a) flutter in the breeze
(b) be sucked together.
(c) be pushed apart.
(d) do none of the above.

(47) The picture of the wing is in the reference frame of
(a) the ground.
(b) the air.
(c) the plane.
(d) – what's a reference frame?

(48) The sail is a wing because
(a) it generates lift
(b) it generates a forward directed force
(c) it generates a torque, turning the boat to face the wind
(d) it generates a torque, tilting the boat over

(49) They lower the unusual "dagger boards" to
(a) generate lift.
(b) lower drag forces.
(c) make it look cool.
(d) get a better view of the course.
(e) look silly.

(50) We can "mass" stars by using
(a) one big scale
(b) Kepler's 1st law
(c) Kepler's 2nd law
(d) Kepler's 3rd law
(e) nope - sorry, it is not possible to mass stars

(51) Ok so all we need are
(a) T
(b) T and a

(c) a
(d) eccentricity
(e) T, a, and eccentricity

(52) In the reference frame of the wave pulse the acceleration of the string around the peak is
(a) 0 since the string is not changing speed
(b) 0 since the string is not moving
(c)
$$a = \frac{v^2}{R}$$
since is the string moving at v and accelerating downward.
(d) Can't tell since accelerations are different in different reference frames
(e)
$$a = \frac{dv}{dt}$$
since is it moving at v.

(53) If we hold one end fixed and oscillate the other end then
(a) we only have one right-moving wave.
(b) initially we will see one wave but then we will see two obvious left- and right-moving waves.
(c) initially we will see one wave but then we will see bumps that move up and down, going nowhere.
(d) we only have one left-moving wave.
(e) er, let's discuss this!

(54) A penny for your thoughts on $PV = nRT$.
(a) Huh?
(b) I am familiar with this relation between temperature, pressure and volume - of a gas.
(c) Ah, the ideal gas law! I know and love $PV = nRT$ or $PV = NkT$

(55) Calorimetry - conservation of energy in terms of mixing stuff and changes of phase
(a) I've never done such problems, that I recall.
(b) I just did a bunch of these problems!
(c) I can recall it and work through these problems.

(56) Entropy -
(a) I've never learned about this that I recall.
(b) I use it often.
(c) I can recall the definition and can work through problems using entropy.

(57) On the laws of thermodynamics
(a) I may have heard of them at some point.
(b) I am comfortable with the laws and can apply them.
(c) I use them regularly.

(58) An organ pipe, of length$L$, has one open end and one closed end. The lowest harmonic would have a wavelength, λ, of
(a) $L/4$
(b) $L/2$
(c) L
(d) $2L$
(e) $4L$

(59) An organ pipe, of length$L$, has one open end and one closed end. The *any* harmonic would have a *frequency* of, since $v = f\lambda$,
(a) $f = nv/4L$ with $n = 1, 2, 3, 4...$
(b) $f = nv/4L$ with $n = 1, 3, 5, 7...$
(c) $f = nv/2L$ with $n = 1, 2, 3, 4...$
(d) $f = nv/2L$ with $n = 1, 3, 5, 7...$
(e) none of the above

(60) At a concert you find yourself next to a speaker. Your ears hurt and you forgot to bring earplugs. But you reduce the intensity of sound by -
(a) forget it! It is hopeless
(b) move away from the speaker, in an open space the volume goes down as $1/r^2$
(c) move away from the speaker, in an open space the volume goes down as $1/r$
(d) move toward the speaker

(61) An emergency vehicle siren emits at 1600 Hz and travels at 32 m/s. What frequency do you hear if you are standing by the road when the vehicle approaches? Assume that the velocity of sound is 343 m/s.
(a) 1600 Hz
(b) 1500 Hz
(c) 1400 Hz
(d) 1800 Hz
(e) 1700 Hz

(62) An emergency vehicle siren emits at 1600 Hz (exactly) and travels at 32.0 m/s. What frequency do you hear as you walk toward the the vehicle at 1.00 m/s as it approaches? Assume that the velocity of sound is 343 m/s.
(a) 1600 Hz
(b) 1490 Hz
(c) 1440 Hz
(d) 1770 Hz
(e) 1760 Hz