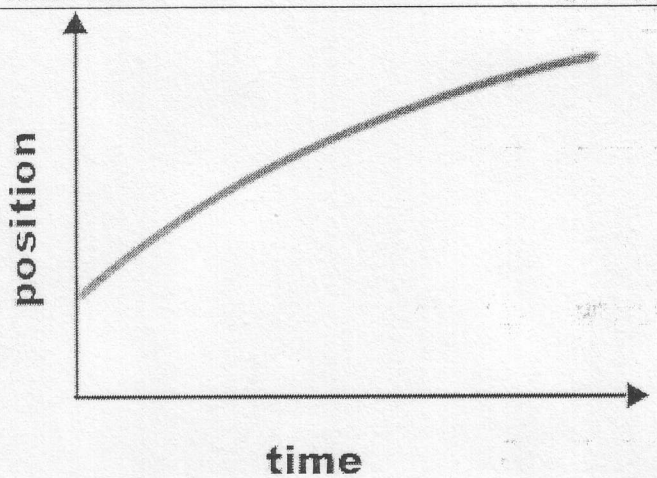
Exam 1 on SEP 09. 2008 - Physics 105 – R. Schad

YOUR NAME

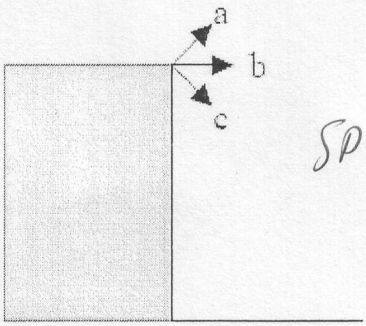
A/B solution

1.	This is to identify the exam version you have – IMPORTANT Mark the A
2.	This is to identify the exam version you have – IMPORTANT Mark the B
3. B	 A train car moves along a long straight track. The graph shows the position as a function of time. The graph shows that the train: a) speeds up all the time. b) slows down all the time. c) speeds up part of the time and slows down part of the time. d) moves at a constant velocity.
4. B	A ball is thrown up into the air. While the ball is in free fall, what does its acceleration do? a) decreases b) remains constant c) increases and then decreases d) increases

5. D

1. A projectile is fired from the edge of a building with a speed v_0. Assume air resistance can be neglected. Which of the directions shown will give the largest speed just before it hits the ground?

(a) direction a
(b) direction b
(c) direction c
(d) all the same
(e) none of these



$$\text{SPEED} = \sqrt{V_x^2 + V_y^2}$$

$$\text{SP-initial} = \sqrt{V_{xi}^2 + V_{yi}^2} = \text{same for all}$$

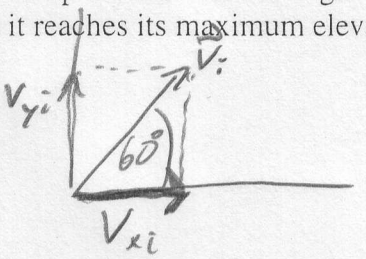
$$V_{yf}^2 = V_{yi}^2 + \underbrace{2a(y_f - y_i)}_{\text{same for all}}$$

$$\text{SP-final} = \sqrt{\underbrace{V_{xi}^2 + V_{yi}^2}_{\text{same}} + \underbrace{2a(y_f - y_i)}_{\text{same}}}$$

6. D

A projectile is fired with a speed of 40 m/s at angle of 60° with respect to the horizon. What is its speed when it reaches its maximum elevation?

a) zero
b) 40 m/s
c) 35 m/s
d) 20 m/s
e) none of these



MAX : $V_y = 0$, V_x unchanged

$V_x = V_i \cos 60°$

7. C

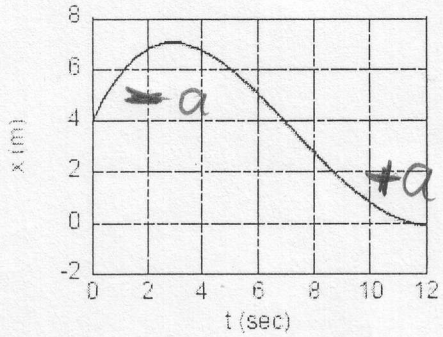
A ball is thrown straight up with a speed of 20 m/s from the edge of a 50 m tall building so that it hits the ground below. What is the speed of the ball just before it hits the ground?

a) 24 m/s
b) 30 m/s
c) 37 m/s
d) 31 m/s
e) none of these

$$V_{yf}^2 = V_{yi}^2 + 2a(y_f - y_i)$$

8. The position of a particle is given in the graph below as a function of time.

D



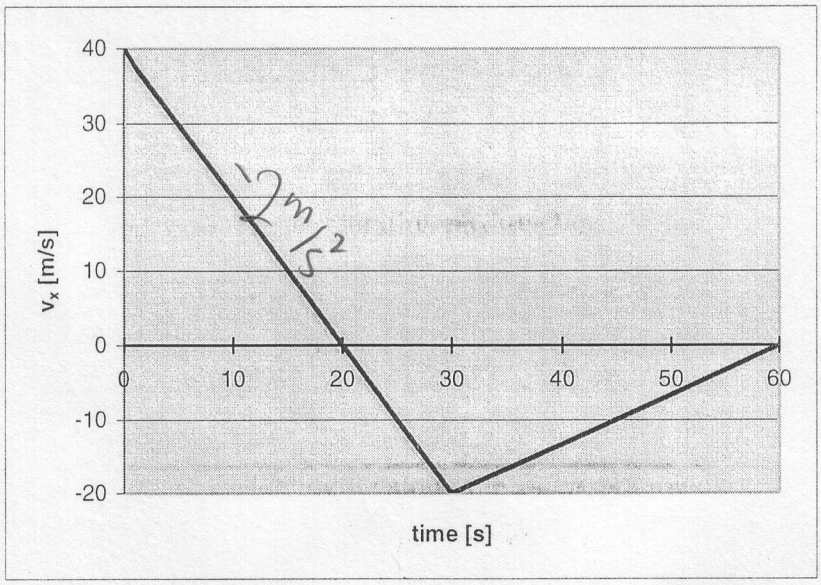
Over what time interval is the acceleration positive?

a) 0 – 3 sec
b) 3 – 6 sec
c) 6 - 8 sec
d) 9 - 12 sec

9. V_x is the velocity of a particle moving along the *x-axis* as shown.

What is the acceleration of the particle at t = 20 s?

B

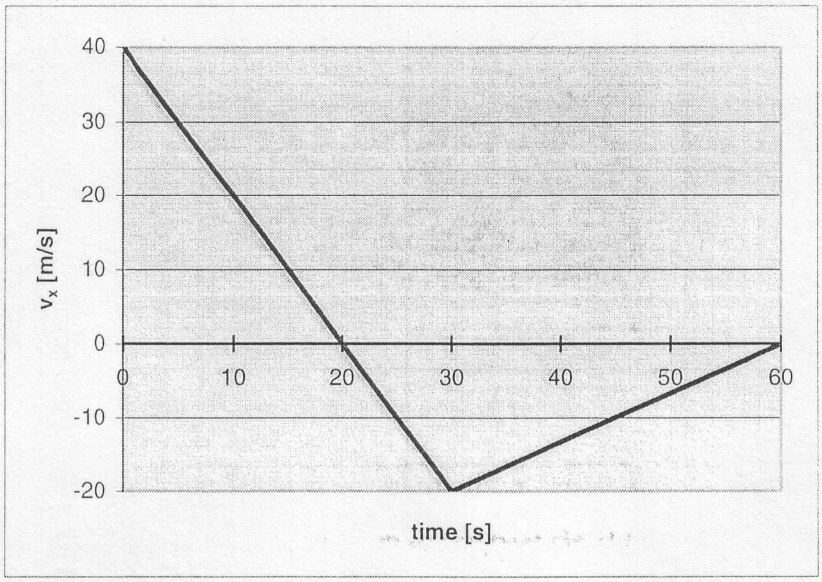


a. +2.0 m/s^2
b. -2.0 m/s^2
c. +1.0 m/s^2
d. –1.0 m/s^2
e. 0 m/s^2

10. V_x is the velocity of a particle moving along the x axis as shown.

If $x = 0$ m at $t = 0$ s, what is the position of the particle at $t = 60$ s?

A



a. 0 m
b. + 1,200 m
c. - 300 m
d. – 1.0 m
e. + 600 m

11. A particle moving along the x-axis has a position given by $x = 54t - 2.0t^3$ m.

E

At the time $t = 3.0$ s, the speed of the particle is zero. Which statement is correct?

a. The particle remains at rest after $t = 3.0$ s.
b. The particle no longer accelerates after $t = 3.0$ s.
c. The particle can be found at positions $x < 0$ m only when $t < 0$ s.
d. All of the above are correct.
e. None of the above is correct.

$$v = \frac{dx}{dt} = (54 - 6t^2)\ m/s$$

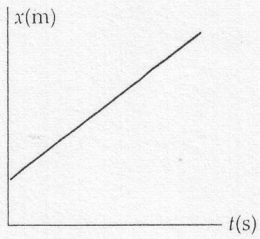
$$a = \frac{dv}{dt} = -12t$$

A : ☹
B : ☹
C : ☹
⇒ E

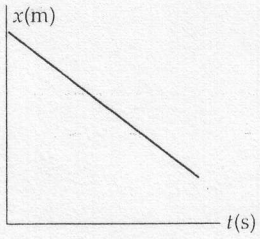
12. E

f. The position of an object at equal time intervals is shown below:

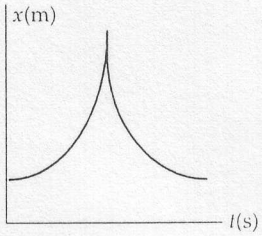
which graph below correctly represents position versus time for this object?



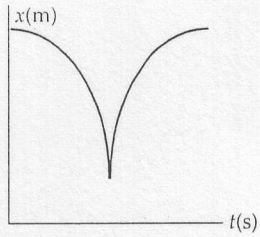
(a)



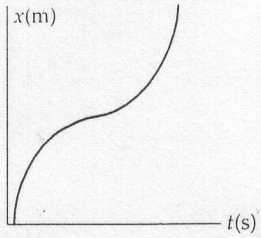
(b)



(c)



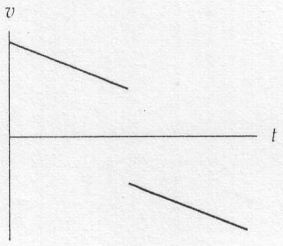
(d)



(e)

13. G

The graph below shows the velocity versus time graph for a ball. Which explanation best fits the motion of the ball as shown by the graph?



a. The ball is falling, is caught, and is thrown down with greater speed.
b. The ball is rolling, stops, and then continues rolling.
c. The ball is rising, hits the ceiling, and falls down.
d. The ball is falling, hits the floor, and bounces up.
e. The ball is rising, is caught, and then is allowed to fall.

velocity acceleration gravitational acceleration	$\mathbf{v} = d\mathbf{x}/dt$ $\mathbf{a} = d\mathbf{v}/dt$ $\mathbf{a} = g = 9.8\ m/s^2$ downwards	
Kinematics (1-dimensional)	$\mathbf{v}_f = \mathbf{v}_i + \mathbf{a}\cdot t$ $\mathbf{x}_f = \mathbf{x}_i + \mathbf{v}_i\cdot t + ½\cdot\mathbf{a}\cdot t^2$ $\mathbf{v}_f^2 = \mathbf{v}_i^2 + 2\mathbf{a}\cdot(\mathbf{x}_f - \mathbf{x}_i)$	
Projectile Motion (2-dimensional)	$v_{xf} = v_{xi}$ $x_f = x_i + v_{xi}\cdot t$	$v_{yf} = v_{yi} + a \cdot t$ $v_{yf}^2 = v_{yi}^2 + 2a_y\cdot(y_f - y_i)$ $y_f = y_i + v_{yi}\cdot t + ½ \cdot a \cdot t^2$
quadratic equation $x^2 + px + q = 0$	$x_{1,2} = -p/2 \pm (p^2/4 - q)^{1/2}$	