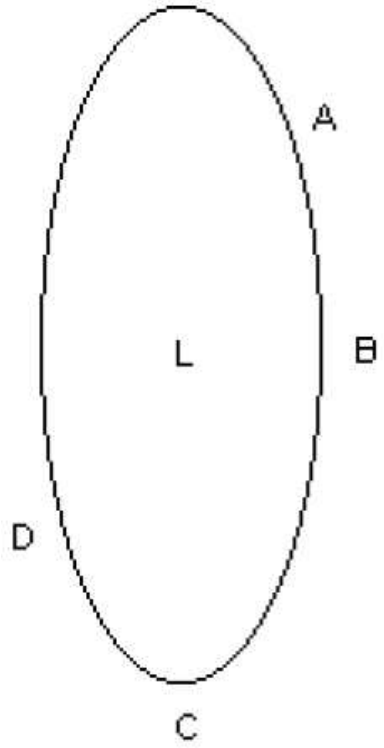
Classroom Voting Questions: Multivariable Calculus

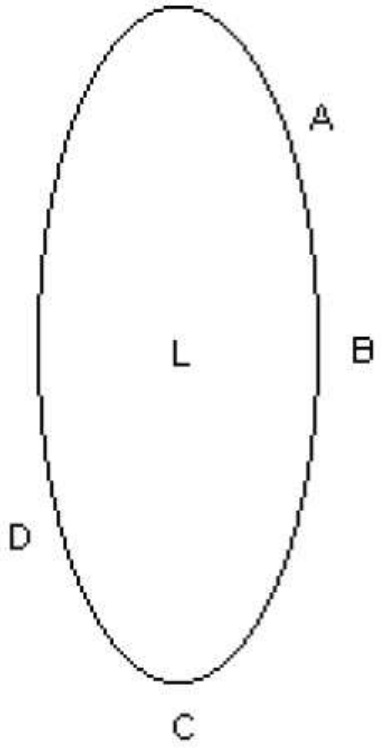
17.2 Motion, Velocity, and Acceleration

1. A lighthouse at position L is in the middle of a lake. Its beam is turning counterclockwise with constant angular velocity. At which point is the velocity vector of the beam largest?



   (a) A
   (b) B
   (c) C
   (d) D

2. A lighthouse at position L is in the middle of a lake. Its beam is turning counterclockwise with constant angular velocity. At which point is the velocity vector of the beam most parallel to $\hat{j}$?



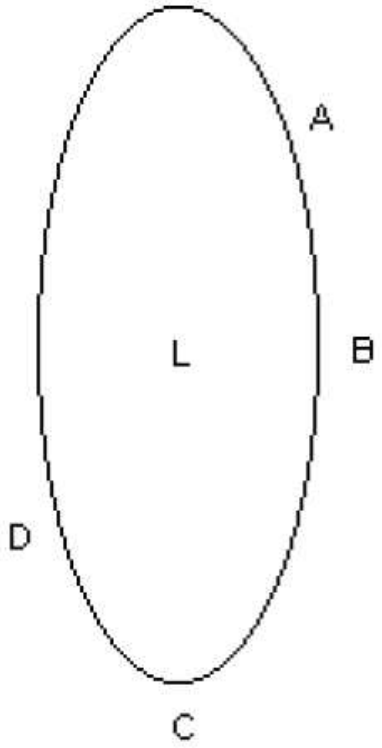
(a) A

(b) B

(c) C

(d) D

3. A lighthouse at position L is in the middle of a lake. Its beam is turning counterclockwise with constant angular velocity. At which point is the acceleration vector of the beam most parallel to $\hat{j}$?



(a) A

(b) B

(c) C

(d) D

4. Which of the following describes the motion of a particle that is moving along a straight line and slowing down?

   (a) $\vec{a}$ and $\vec{v}$ are parallel and point in the same direction.

   (b) $\vec{a}$ and $\vec{v}$ are parallel and point in opposite directions.

   (c) $\vec{a}$ and $\vec{v}$ are perpendicular.

   (d) None of the above.

5. True or False: If the speed of a particle is zero, its velocity must be zero.

   (a) True, and I am very confident

   (b) True, but I am not very confident

   (c) False, but I am not very confident

   (d) False, and I am very confident

6. A particle that is not accelerating must have zero velocity.

   (a) True, and I am very confident
   (b) True, but I am not very confident
   (c) False, but I am not very confident
   (d) False, and I am very confident

7. A particle with constant speed must have zero acceleration.

   (a) True, and I am very confident
   (b) True, but I am not very confident
   (c) False, but I am not very confident
   (d) False, and I am very confident

8. A particle with zero acceleration must have constant speed.

   (a) True, and I am very confident
   (b) True, but I am not very confident
   (c) False, but I am not very confident
   (d) False, and I am very confident

9. A particle with constant speed must have constant velocity.

   (a) True, and I am very confident
   (b) True, but I am not very confident
   (c) False, but I am not very confident
   (d) False, and I am very confident

10. The functions $x(t)$ and $y(t)$ describe the coordinates of a jeep in miles as it drives around the desert from noon ($t = 0$ hrs) until 2 pm ($t = 2$ hrs), when the jeep returns to its starting location. We want to use these functions to predict how many miles will be recorded on the odometer during this interval by doing an integral of some function $\int_0^2 f(t)\,dt$. What units must the function $f(t)$ have?

    (a) miles
    (b) miles/hr
    (c) miles/hr^2

(d) $\text{miles}^2/\text{hr}^2$

(e) None of the above

11. The functions $x(t)$ and $y(t)$ describe the coordinates of a jeep in miles as it drives around the desert from noon ($t = 0$ hrs) until 2 pm ($t = 2$ hrs), when the jeep returns to its starting location. Which of the following must be true?

(a) $\int_0^2 x(t)\,dt = 0$

(b) $\int_0^2 x'(t)\,dt = 0$

(c) $\int_0^2 x''(t)\,dt = 0$

(d) More than one of the above

(e) None of the above

12. The functions $x(t) = 2\sin \pi t$ and $y(t) = 2\cos \pi t$ describe the coordinates of a jeep in miles as it drives around the desert from noon ($t = 0$ hrs) until 2 pm ($t = 2$ hrs), when the jeep returns to its starting location. According to the jeep's odometer, how far will it have traveled?

(a) 4 miles

(b) 2π miles

(c) 4π miles

(d) $8\pi^2$ miles

(e) None of the above