

Name \_\_\_\_\_

- 1) A particle starts moving at initial position  $r(0) = \langle 1, 2, 3 \rangle$  with initial velocity  $v(0) = \langle 1, -2, 1 \rangle$ . Its acceleration is  $a(t) = \langle 2t, t^2, 1 \rangle$ . Find its position at  $r(3)$ .
- 2) Sally, the clown, is shot from a cannon placed at ground level with an initial velocity of 60 fps and an angle of 60 degrees. How far from the cannon should a net be paced if the net is 10 feet above ground level?
- 3) Find the speed of an object moving in space that has the position function given by:  
 $r(t) = \langle 4t, 3 \cos t, 3 \sin t \rangle$
- 4) Find the point on the curve where  $y = x^3$  has maximum curvature.
- 5) Evaluate the limit:  $\lim_{t \rightarrow 1} \langle \sqrt{t}, \frac{\ln t}{t^2 - 1}, 2t^2 \rangle$
- 6) Find  $\mathbf{T}(t)$  for  $r(t) = t^2 \mathbf{i} + t \mathbf{j} + \frac{4}{3} \mathbf{k}$
- 7) A projectile is fired from ground level at an angle of 12 degrees with the horizontal. The projectile is to have a range of 150 feet. Find the minimum initial velocity.
- 8) Find the curvature of  $r(t) = t^2 \mathbf{i} + t \mathbf{j}$  at  $t=2$
- 9) Find the length of the curve given by:  $r(t) = \langle \cos t + t \sin t, \sin t - t \cos t, t^2 \rangle$  for  $0 \leq t \leq \pi/2$
- 10)