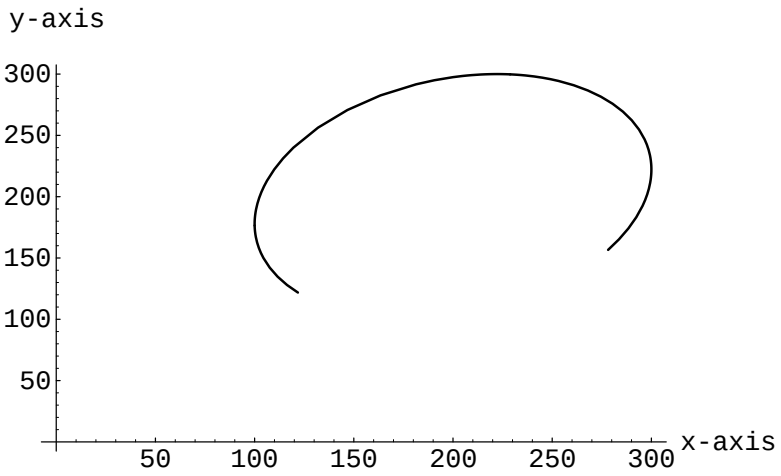
Math 120A
February 26, 1998
Quiz #5 (20 points)

Name _____

TA: _____

Instructions: You have 30 minutes. You **MUST** show work for credit. If in doubt, ask for clarification.

1. (5 points) A point is moving in the xy-coordinate system according to the parametric equations:
   $x(t) = 100\sin(\frac{2\pi}{7}(t-6)) + 200$
   $y(t) = 100\sin(\frac{2\pi}{7}(t-0.5)) + 200$
   where t represents time in seconds and $0 \leq t \leq 5$. Here is a graph of this parametrized curve.

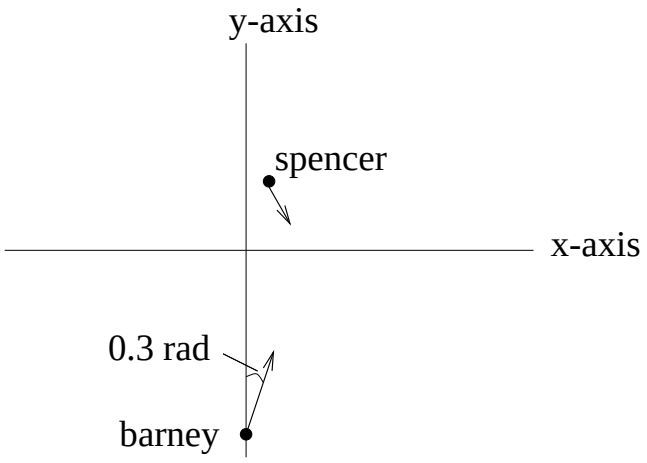


   (a) (3pts) Where is the object located at time $t = 0$ seconds? (Find the coordinates and mark in the picture.)
   $P(0) = (278.2, 156.6)$; point should be labeled on the curve.

   (b) (1pts) Which direction is the point moving along the curve? (Indicate with some sort of arrow.)
   Moves from $P(0)$ in part (a) to the other end of the curve.

   (c) (1 pts) Can you find a function $y = f(x)$ whose graph is this parametrized curve? (Justify)
   No; curve violates the vertical line test.

2. Barney and Spencer start at the two locations pictured in the xy-coordinate system; the units on each axis will be meters. Barney is initially located at the point (0,-8) and has a speed of 3 meters/sec in the direction indicated. Spencer has parametric equations: $S(t) = (x_S(t), y_S(t))$, where $x_S(t) = 1 + t, y_S(t) = 3 - 2t$. Barney and Spencer start moving at the same time.



(a) (2pts) Find Spencer's initial coordinates at time $t = 0$.
$(1, 3)$

(b) (1pts) Find the time when Spencer crosses the x-axis.
Solve $y_S(t) = 0$; get $t = 3/2$, plug into $S(3/2) = (5/2, 0)$ to be the place Spencer crosses the x-axis.

(c) (5pts) Find parametric equations for Barney's motion.
Resolve Barney's velocity vector; the direction angle is $\frac{\pi}{2} - 0.3 = 1.271$ rad. Get $v_x = 0.886$ m/s and $v_y = 2.866$ m/s. Conclude Barney's position at time t is given by $B(t) = (0.886t, -8 + 2.866t)$.

(d) (4pts) Find the distance between Barney and Spencer at time t. Your answer should be a function in the variable t. Use your formula to calculate the distance between these guys at time $t = 2$ seconds.
Use the distance formula to get $d(t) = \sqrt{(.886t - 1 - t)^2 + (-8 + 2.866t - 3 + 2t)^2}$ This answer is ok, could simplify to get $d(t) = \sqrt{23.691t^2 - 106.82t + 122}$. Calculate $d(2) = 1.77$ meters.

(e) (3pts) What is the velocity vector for Spencer? (You need to specify Spencer's speed and direction.)
Speed is $|v| = \sqrt{(-2)^2 + 1} = 2.24$ m/s. Direction is $\theta = -1.107$ rad or $\theta = 5.176$ rad.