SOLUTIONS

Math 259 **Winter 2009**

Quiz #2

1. **(2.5 points)** Find an equation for the tangent line to the curve:

$$x(t) = t^2 - 2t \qquad \text{and} \qquad y(t) = t^2 + 2t,$$

when $t = 1$. Show your work, write your final answer in the space provided below, and express your final answer in the form: $y = m \cdot x + b$.

The coordinates of the point of tangency are:

$x(1) = 1 - 2 = -1$ $\qquad$ $y(1) = 1 + 2 = 3.$

The slope of the tangent line, m, is calculated:

$$\frac{dx}{dt} = 2t - 2 \quad \text{so} \quad \left.\frac{dx}{dt}\right|_{t=1} = 0$$

$$\frac{dy}{dt} = 2t + 2 \quad \text{so} \quad \left.\frac{dy}{dt}\right|_{t=1} = 4.$$

The derivative dy/dx is undefined at the point $(-1, 3)$ as $\left.dx/dt\right|_{t=1} = 0$. This means that the tangent line is vertical.

FINAL ANSWER:	$x = -1.$

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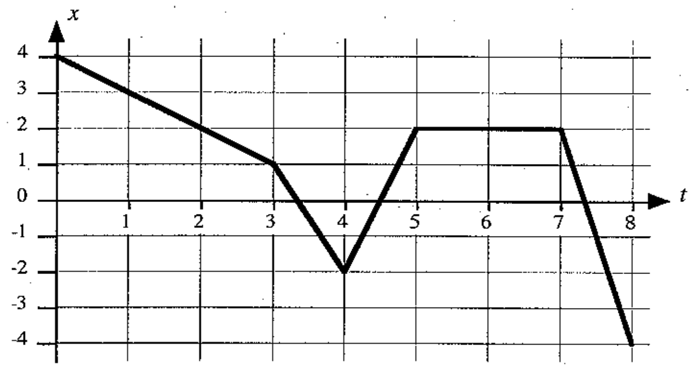
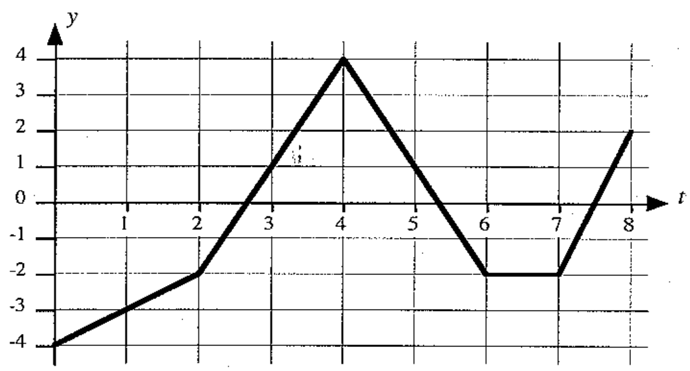
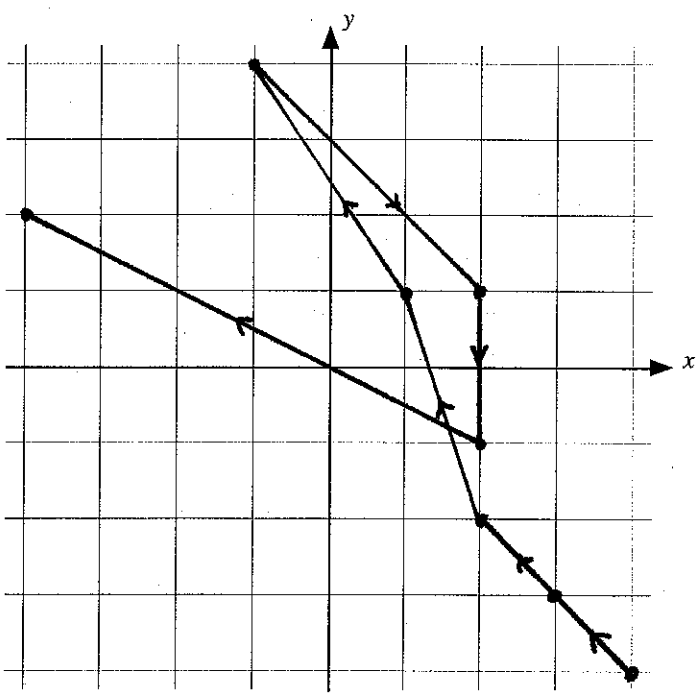
2. **(3 points)** The graphs shown below give the x- and y-coordinates of a point as functions of time t. Use the axes provided at the bottom of the page to draw an accurate sketch of the path that the particle follows in the x-y plane.

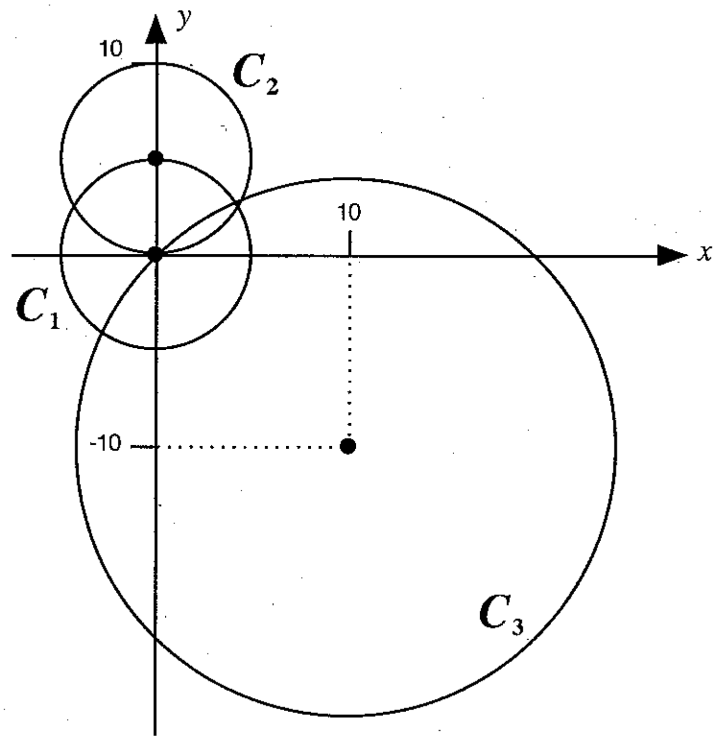






SOLUTIONS

3. **(4.5 points)** The diagram shown below shows three circles, C_1, C_2 and C_3. The dots show the location of the center of each circle.



The parametric equations for each of the three circles can be written in the form:

$$x(t) = a + k \cdot \cos(t) \qquad \text{and} \qquad y(t) = b + k \cdot \sin(t),$$

with $0 \le t \le 2\pi$ where a, b and k are all constants. Determine the values of a, b and k for each circle and record your values in the table given below. If you believe that there is insufficient information to determine the value of a particular constant for a particular circle, **write "INS" in the corresponding part of the table.**

	Circle C_1	Circle C_2	Circle C_3
a	0	0	10
b	0	5	−10
k	5	5	$10 \cdot \sqrt{2}$