Worksheet-Week #1

Circles and Tangent lines

Math 124

Introduction

In this worksheet, we review equations of circles, describe a method to find the equation of a tangent line through a given point on a circle, then look at applications.

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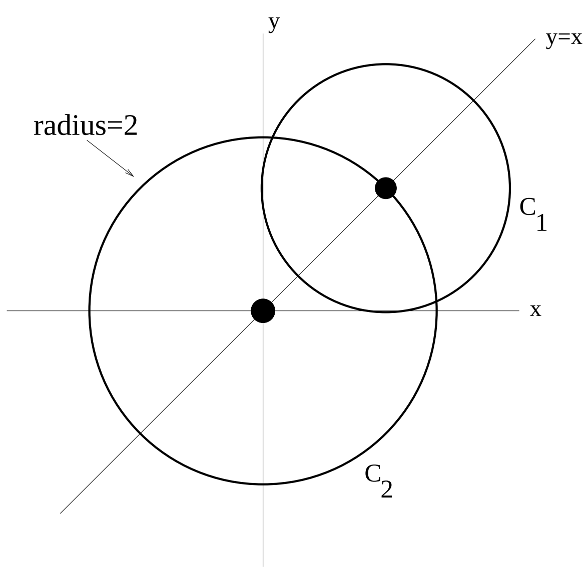
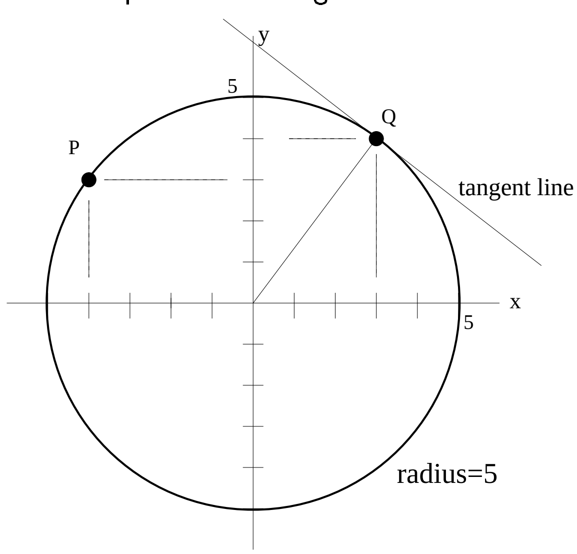
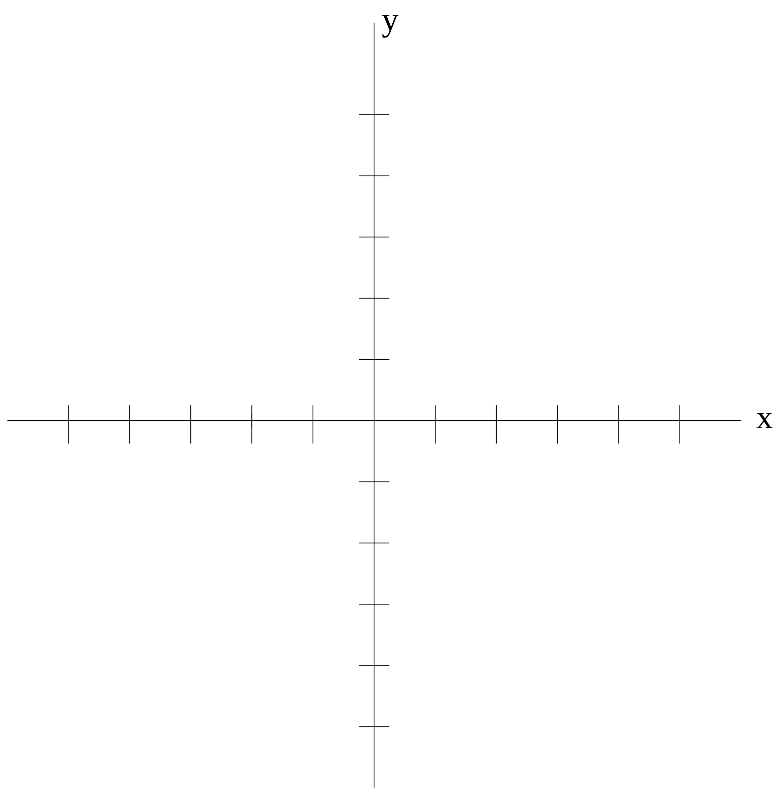
1. (Circles) Find the equations for circles C_1 and C_2.



2. (Tangents) Given any point Q on a circle, a tangent line to the circle through Q is perpendicular to a radial line connecting the circle center and the point Q. Use this information to find equations of tangent lines at P and Q.



3. (More tangents) Sketch the circle of radius 2 centered at the point $(3, -3)$ and the line ℓ with equation $y = 2x + 2$. Find the coordinates of all points on the circle where the tangent line is perpendicular to ℓ



4. (Tangents) Draw the circle with equation $x^2 + y^2 = 25$ and the points $P = (-3, -4)$ and $Q = (-8, 0)$. Explain why P is on the circle. Is the line passing thru P and Q tangent to the circle? Explain your answer.

If your group has finished the worksheet, work on this problem from homework #1:

An object is moving in the xy-plane; the units on each axis are "feet". Its coordinate at time t seconds is $P(t) = (1+t, 2t)$. We can write $P(t) = (x(t), y(t))$, where $x(t) = 1+t$ and $y(t) = 2t$. We call $x(t)$ and $y(t)$ the parametric equations for the motion of the object.

1. Sketch a coordinate system along with the points $P(0)$, $P(1)$ and $P(2)$. Sketch the path along which the object is moving.
2. Find the equation $y = mx + b$ of the line along which the object is moving. *(Hint: Set $x = x(t)$, solve for t, then plug this into $y = y(t)$ to get an equation relating x and y.)*
3. Find the formula for a function $y = d(t)$ that calculates the distance between the object and the point $(1, 1)$ at time t seconds.
4. Find the formula for the function $s(t) = [d(t)]^2$. Sketch the graph of $s(t)$ and find the coordinates of the vertex of the graph. Does the function $s(t)$ have a maximum or minimum value? If so, what is it?
5. Find when the object is closest to the point $(1, 1)$, the location of the object at this time and the minimum distance.