1.5 Tangent Lines

1. Draw the circle of radius 5 centered at the origin. Use the "radial line approach" to find the equation of the tangent line to the circle at the points $(3,-4),(-4,3),(-3,-4),(4,-3)$. Also, pick one of these four points and calculate the slope of the tangent line using the "simultaneous equation approach". What is the equation of the tangent line to the circle at the points $(0,5)$ or $(0,-5)$? What is the equation of the tangent line to the circle at $(5,0)$ or $(-5,0)$?

2. Draw the circle of radius 13 centered at the origin. Use the "radial line approach" to answer the following tangent line questions:

   (a) Find the equation of a tangent line to the circle through the point $P=(12,5)$. Sketch the picture.

   (b) Find the equation of a tangent line to the circle through the point $P=(-5,12)$. Sketch the picture.

   (c) Find the equation of a tangent line to the circle through the point $P=(\sqrt{48},-11)$. Sketch the picture.

   (d) Find the equation of a tangent line to the circle through the point $P=(2,\sqrt{165})$. Sketch the picture.

   (e) Find the equation of a tangent line to the circle through the point $P=(0,13)$. Sketch the picture.

3. Draw the ellipse having equation $\frac{x^2}{16}+\frac{y^2}{4}=1$. Plot the point $P=(2,\sqrt{3})$. Use the "simultaneous equation approach" to find the equation of the tangent line to the ellipse at the point P. Sketch the picture. Repeat the process for the point $Q=(2,-\sqrt{3})$.