University of Calgary
Faculty of Science
Department of Mathematics and Statistics

Math 251

Worksheet 2

1. Determine the equation of a straight line in each case:

   a. The straight line passes through the point A(2,1) and has a slope of -2.

   b. The straight line contains the points A(3,-4) and B(-1,2).

   c. The straight line has y-intercept = 5 and x-intercept = -3.

   d. The straight line is parallel to the straight line 3x - 4y = 12 and passes through the point (-2,-3).

   e. the straight line is perpendicular to the straight line 4x + 5y = -20 and passes through the mid-point of the line segment AB where A is has coordinates (-1,1) and B has coordinates (5,-2).

2. Determine the equation of the circle which has diameter AB where A and B are the points given in 1(e).

3. Determine the equation of the circle which has centre at (-2,1) and which passes through the point (2,4).

4. Determine the equation of the circle whose centre is at the point of intersection of the lines 2x - 3y = 7 and 3x + 5y = 1, and which has a radius of 4 units.

5. Determine the equation of the circle which is tangent to the x-axis and which has centre at the point (3,-1).

6. Determine the equation of the circle which is tangent to the y-axis and which has centre at the point (4,-2).

7. A point P(h,k) lies outside of the straight line AB. The straight line AB has equation ax + by + c = 0. Determine the perpendicular distance from P to AB.

8. The straight lines L_1 and L_2 have slopes equal to m_1 and m_2 respectively. If L_1 and L_2 are perpendicular, neither line being parallel to either axis, show that $m_1\ m_2 = -1$. [Hint: Use the fact that the slope of a straight line is the tangent of the angle that the line makes with the positive direction of the x-axis.]

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9. Show that the equation of the tangent line to the circle with equation $x^2 + y^2 = r^2$, at the point (h,k) on the circle is given by $hx + ky = r^2$.

10. A circle has equation $x^2 + y^2 + 2gx + 2fy + c = 0$. Show that the equation of the tangent line to the circle at point P(h,k) on the circle is given by:

$$hx + ky + g(x + h) + f(y + k) + c = 0.$$

Does this generalize to other conics?