MATHEMATICS 17 **EXERCISE 5**

I. Linear Equations.

1. Find the general form of the equation of the line that is perpendicular to the line $x + 2y = 3$ and passes through the midpoint of the points $P\,(1, 3)$ and $Q\,(-5, 1)$.
2. Find the ordinate of the point whose abscissa is -3 which is collinear with the points $(3, 2)$ and $(0, 5)$.

II. Equation of a Circle.

1. Given the equation $3x^2 + 3y^2 - 6x + 12y - 2 = 0$, Determine the following:
   (a) Center and radius of the circle (if it exists).
   (b) The general form of the equation of the line that passes through the center of the circle and is parallel with the y-axis.
2. Find the equation of the cirle with it's center at $(2, 3)$ tangent to the line whose equation is $y = 7$.

III. Quadratic Equations.

1. Find the sum of the reciprocal of the roots of the quadratic equation $2x^2 + 3x = -13$.
2. Find the value/s of k such that
   (a) The equation $3x^2 + 9x = 17 + 6kx$ have roots that have equal magnitude but opposite in sign.
   (b) The graph of $y = x^2 + kx + k + 8$ intersects the x axis at two distinct points.
3. The cable of a suspension bridge hangs in form of a parabola. The distance between the two towers is 150 m, the points of support of the cable on the towers are 22 m above the roadway and lowest part of the cable is 7m above the roadway. Find the vertical distance to the cable from a point in the roadway 15 m from the foot of the tower.
4. Find the vertex, focus and directrix of the following parabolas.
   (a) $x^2 - 4x - 8y - 28 = 0$
   (b) $y = \frac{1}{16}x^2 + \frac{1}{2}x$
5. If the line $2x = 4$ passes through the focus of a certain parabola, what is the coordinate of the focus if the parabola with equation $y = ax^2 + bx + c$ passes through $P\,(-2, 2)$ and $Q\,(2, -2)$.

IV. Find the solution set of the following equations.

1. $\dfrac{2x-3}{3x^2+2x-1} + \dfrac{x}{x^2-1} = \dfrac{5}{3x-1}$
2. $\dfrac{32}{x^2+3x+2} - 3 = \dfrac{x-3}{x+1}$
3. $\dfrac{w}{3w^2-8w+4} = \dfrac{w+2}{3w^2+w-2}$
4. $9x^2 + 9y^2 + 6x - 6y + 5 = 0$
5. $4x^2 + 4y^2 + 24x - 4y + 1 = 0$
6. $0.35\,(u + 0.34) - 0.15u = 0.2u - 1.66$
7. $3z^2 + 1 = 8z$ *[using completing the square]*
8. $9s^2 + 7 = 12s$ *[quadratic formula]*

Examples from CAT by Castillo, et. al, CAT by Leithold, Precalculus by Barnett, et. al, MAT3rd by Vance

compiled by mpona2010