

**Problems of Conics**


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- 1) A circle has a diameter whose end points are  $A(6, 6)$  and  $B(0, -2)$ . Calculate center, radius and equation of this circle.
- 2) Calculate the intersection points of the following pairs of circles:  
 $C_1: (x + 3)^2 + (y - 8)^2 = 25$   
 $C_2: x^2 + y^2 - 2x - 24 = 0.$
- 3) Determine if the points  $P(1, 11)$  and  $Q(8, 3)$  are inside or outside to the following circle:  
 $x^2 + (y - 9)^2 = 25.$
- 4) The circle  $x^2 + y^2 + 32x - 16y + 220 = 0$  passes through the point  $A(-24, 14)$ . Find out the equation of the tangent line to the circle at this point.
- 5) Find out the equation of the circumference centered at the point  $C(-3, 3)$ , of radius  $\sqrt{65}$ .
- 6) Find out the center and radius of the following circle:  
 $x^2 + y^2 - 10x - 4y + 4 = 0.$
- 7) Discuss the relative position between the circle  $x^2 + (y + 12)^2 = 20$  and each of the following lines. Find out the intersection point(s) if possible.  
**a)**  $2x - y + 1 = 0$     **b)**  $x + 2y + 34 = 0$     **c)**  $3x + y + 2 = 0.$
- 8) Calculate the values of parameter  $m$  for which the line  $4x - 3y + m = 0$  is tangent to the following circle and find the tangent point.  
 $(x + 1)^2 + y^2 = 25.$
- 9) An ellipse has foci at the points  $F'(0, -24)$  and  $F(0, 24)$  and a vertex at the point  $(18, 0)$ . Determine:  
**a)** Center. **b)** The other three vertices. **c)** Equation. **d)** Eccentricity.
- 10) Consider the ellipse  $64x^2 + 289y^2 - 18496 = 0$   
 Calculate: **a)** Semimajor and semiminor axis. **b)** Foci. **c)** Center. **d)** Vertices. **e)** Eccentricity .
- 11) An ellipse is centered at the origin and has vertices at the points  $(17, 0)$  and  $(0, 8)$ . Determine:  
**a)** Foci. **b)** Equation. **c)** Eccentricity.
- 12) Consider the ellipse  $\frac{x^2}{64} + \frac{y^2}{100} = 1$   
 Calculate: **a)** Semimajor and semiminor axis. **b)** Foci. **c)** Center. **d)** Vertices. **e)** Eccentricity .

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13) The equation of an ellipse is  $\frac{(x-1)^2}{625} + \frac{(y-8)^2}{576} = 1$

Determine: **a)** Semimajor and semiminor axis. **b)** Foci. **c)** Center. **d)** Vertices. **e)** Eccentricity.

14) The equation of an ellipse is  $289x^2 + 64y^2 - 1156x - 896y - 14204 = 0$

Determine: **a)** Semimajor and semiminor axis. **b)** Foci. **c)** Center. **d)** Vertices. **e)** Eccentricity.

15) A hyperbola has foci at the points  $F'(-25, 0)$  and  $F(25, 0)$  and a vertex at  $(20, 0)$ . Determine:

**a)** Center. **b)** The other vertex. **c)** Equation. **d)** Eccentricity. **e)** Asymptotes.

16) Consider the hyperbola  $16x^2 - 9y^2 - 576 = 0$

Determine: **a)** Semiaxis. **b)** Foci. **c)** Center. **d)** Vertices. **e)** Eccentricity. **f)** Asymptotes.

17) A hyperbola is centered at origin and has a vertex at the point  $(0, 8)$  and its asymptotes are  $y = \pm \frac{8}{15}x$ .

Find out: **a)** Foci. **b)** Equation. **c)** Eccentricity.

18) Consider the hyperbola  $\frac{x^2}{576} - \frac{y^2}{49} = 1$

Calculate: **a)** Semiaxis. **b)** Foci. **c)** Center. **d)** Vertices. **e)** Eccentricity. **f)** Asymptotes.

19) Consider the hyperbola  $\frac{(x+1)^2}{256} - \frac{(y-2)^2}{144} = 1$

Find out: **a)** Semiaxis. **b)** Foci. **c)** Center. **d)** Vertices. **e)** Eccentricity.

20) Consider the hyperbola  $64x^2 - 225y^2 + 256x + 450y + 14431 = 0$

Calculate: **a)** Semiaxis. **b)** Foci. **c)** Center. **d)** Vertices. **e)** Eccentricity.

21) The focus of a parabola is  $F(3, 0)$  and its vertex is  $V(0, 0)$ . Calculate: **a)** Directrix. **b)** Equation.

22) Consider the parabola  $y^2 - 16x = 0$ . Determine: **a)** Focus. **b)** Vertex. **c)** Directrix.

23) Consider the parabola  $y^2 = 32x$ . Determine: **a)** Focus. **b)** Vertex. **c)** Directrix.

24) A parabola has its focus at the point  $F(3, 0)$  and its directrix is  $x = -3$ . Calculate: **a)** Vertex.

**b)** Equation.

25) Consider the parabola  $x^2 - 4x + 8y - 28 = 0$ . Calculate: **a)** Focus. **b)** Vertex. **c)** Directrix.

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26) The focus of a parabola is  $F(-15, -4)$  and its vertex is  $V(-8, -4)$ . Find out: **a)** Directrix. **b)** Equation.

27) Match each equation of conic section with its graph:

**a)**  $\frac{y^2}{9} - \frac{x^2}{9} = 1$

**b)**  $x = -2y^2$

**c)**  $y = -x^2$

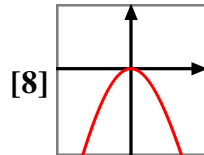
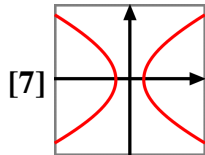
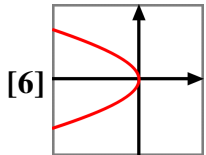
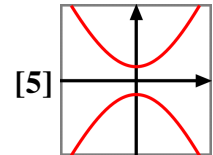
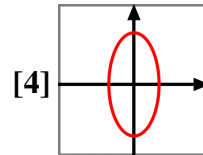
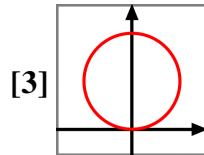
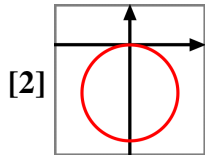
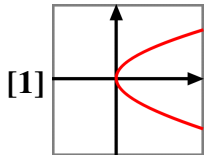
**d)**  $\frac{x^2}{64} + \frac{y^2}{256} = 1$

**e)**  $x = 2y^2$

**f)**  $x^2 + (y + 5)^2 = 25$

**g)**  $x^2 + (y - 2)^2 = 4$

**h)**  $\frac{x^2}{64} - \frac{y^2}{64} = 1$



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**Answers:**

- 1) (3, 2);  $r = 5$ ;  $(x - 3)^2 + (y - 2)^2 = 25$ ;  $x^2 + y^2 - 6x - 4y - 12 = 0$
- 2) (1, 5); (-3, 3)
- 3)  $P$  is inside;  $Q$  is outside
- 4)  $4x - 3y + 138 = 0$
- 5)  $(x + 3)^2 + (y - 3)^2 = 65$ ;  $x^2 + y^2 + 6x - 6y - 47 = 0$
- 6) (5, 2);  $r = 5$
- 7) **a)** Disjoint (exterior); **b)** Tangent at (-2, -16); **c)** Secant at (2, -8) and (4, -14)
- 8)  $m_1 = -21 \rightarrow$  Tangent at (3, -3);  $m_2 = 29 \rightarrow$  Tangent at (-5, 3)
- 9) **a)** (0, 0) **b)** (-18, 0), (0, -30), (0, 30) **c)**  $\frac{x^2}{324} + \frac{y^2}{900} = 1$  **d)**  $\frac{4}{5}$
- 10) **a)** 17, 8 **b)**  $F'(-15, 0)$ ,  $F(15, 0)$  **c)** (0, 0)  
**d)** (-17, 0), (17, 0), (0, -8), (0, 8) **e)**  $\frac{15}{17}$
- 11) **a)**  $F'(-15, 0)$ ,  $F(15, 0)$  **b)**  $\frac{x^2}{289} + \frac{y^2}{64} = 1$  **c)**  $\frac{15}{17}$
- 12) **a)** 8, 10 **b)**  $F'(0, -6)$ ,  $F(0, 6)$  **c)** (0, 0)  
**d)** (-8, 0), (8, 0), (0, -10), (0, 10) **e)**  $\frac{3}{5}$
- 13) **a)** 25, 24 **b)**  $F'(-6, 8)$ ,  $F(8, 8)$  **c)** (1, 8)  
**d)** (-24, 8), (26, 8), (1, -16), (1, 32) **e)**  $\frac{7}{25}$
- 14) **a)** 8, 17 **b)**  $F'(2, -8)$ ,  $F(2, 22)$  **c)** (2, 7)  
**d)** (-6, 7), (10, 7), (2, -10), (2, 24) **e)**  $\frac{15}{17}$
- 15) **a)** (0, 0) **b)** (-20, 0) **c)**  $\frac{x^2}{400} - \frac{y^2}{225} = 1$  **d)**  $\frac{5}{4}$  **e)**  $y = \pm \frac{3}{4}x$
- 16) **a)** 6 **b)**  $F'(-10, 0)$ ,  $F(10, 0)$  **c)** (0, 0)  
**d)** (-6, 0), (6, 0) **e)**  $\frac{5}{3}$  **f)**  $y = \pm \frac{4}{3}x$
- 17) **a)**  $F'(0, -17)$ ,  $F(0, 17)$  **b)**  $\frac{y^2}{64} - \frac{x^2}{225} = 1$  **c)**  $\frac{17}{8}$
- 18) **a)** 24 **b)**  $F'(-25, 0)$ ,  $F(25, 0)$  **c)** (0, 0)  
**d)** (-24, 0), (24, 0) **e)**  $\frac{25}{24}$  **f)**  $y = \pm \frac{7}{24}x$
- 19) **a)** 16 **b)**  $F'(-21, 2)$ ,  $F(19, 2)$  **c)** (-1, 2)  
**d)** (-17, 2), (15, 2) **e)**  $\frac{5}{4}$
- 20) **a)** 8 **b)**  $F'(-2, -16)$ ,  $F(-2, 18)$  **c)**  $(-2, 1)$   
 $\frac{1}{4}$

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- 21)      a)  $x = -3$     b)  $y^2 = 12x$
- 22)      a)  $F(4, 0)$     b)  $V(0, 0)$     c)  $x = -4$
- 23)      a)  $F(8, 0)$     b)  $V(0, 0)$     c)  $x = -8$
- 24)      a)  $V(0, 0)$     b)  $y^2 = 12x$
- 25)      a)  $F(2, 2)$     b)  $V(2, 4)$     c)  $y = 6$
- 26)      a)  $x = -1$     b)  $(y + 4)^2 = -28(x + 8)$
- 27)      a) [5]            b) [6]            c) [8]            d) [4]            e) [1]            f) [2]  
          g) [3]            h) [7]