MATH 161 — Precalculus[1]
Community College of Philadelphia

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Math 161 — Chapter 8
Class Exercises

1. Find the length of the hypotenuse of a right triangle with legs of the length given. If approximation is necessary, approximate to three decimal places.

   (a) 6 and 10

   (b) 5 and 12

   (c) 8.3 and 9.2

   (d) 40 and 41

2. Find the distance between each pair of points given.

   (a) $(0, 2)$ and $(0, 8)$

   (b) $(-3, 4)$ and $(-3, 19)$

   (c) $(8, 17)$ and $(-19, 17)$

   (d) $(8, 2)$ and $(15, 24)$

   (e) $(103, 279)$ and $(112, 288)$

   (f) $(0, 0)$ and $(5, 5)$

   (g) $(8, 7)$ and $(-2, -4)$

   (h) $(1 + \sqrt{2}, 3 - \sqrt{3})$ and $(\sqrt{2}, 3)$

   (i) (x, y) and $(0, 0)$

   (j) (x, y) and (h, k)

3. Find the distance of each point from $(2, 3)$.

   (a) $(5, 7)$

   (b) $(-1, -1)$

   (c) $(2, 8)$

   (d) $(5, -1)$

   (e) $(-1, 7)$

(f) $(2, -2)$

(g) $(7, 3)$

(h) (x, y)

4. If the point (x, y) in 3 is the same distance as the other points from $(2, 3)$, write an equation it must satisfy.

5. Give the coordinates of five points that are 5 units from $(0, 0)$.

6. Find the distance between each point and line given.

   (a) $(7, 5)$ and the x-axis

   (b) $(7, 5)$ and the y-axis

   (c) $(3, 4)$ and $y = 8$

   (d) $(3, 4)$ and $x = -7$

   (e) $(4, 3)$ and $y = x$

   (f) $(3, 0)$ and $y = x - 2$

   (g) $(1, 1)$ and $y = -x$

   (h) $(7, 4)$ and $y = 2x - 1$

7. Give the equation of the circle with center and radius given. Expand and collect like terms.

   (a) center $(0, 0)$, radius 10

   (b) center $(0, 3)$, radius 4

   (c) center $(8, -2)$, radius 9

   (d) center $(6, -5)$, radius 4

   (e) center $(-1, -5)$, radius 23

   (f) center (a, b), radius a

   (g) center $(3, -1)$, radius $\sqrt{10}$

   (h) center $(\sqrt{2}, \sqrt{5})$, radius $\sqrt{7}$

8. Sketch the graph of each circle whose equation you found in the preceding exercise.

9. Give an equation of the ellipse with the given foci F_1 and F_2.Take the sum of the distances of a point (x, y) on the ellipse from F_1 and F_2 to be d.

   (a) $F_1 = (-2, 0)$ $F_2 = (2, 0)$, $d = 8$
   (b) $F_1 = (-5, 0)$ $F_2 = (5, 0)$, $d = 15$
   (c) $F_1 = (0, -3)$ $F_2 = (0, 3)$, $d = 10$
   (d) $F_1 = (0, -1)$ $F_2 = (0, 1)$, $d = 6$
   (e) $F_1 = (0, -2)$ $F_2 = (0, 3)$, $d = 9$
   (f) $F_1 = (-2, 0)$ $F_2 = (1, 0)$, $d = 5$
   (g) $F_1 = (-2, 3)$ $F_2 = (2, 3)$, $d = 8$
   (h) $F_1 = (-c, 0)$ $F_2 = (c, 0)$, $d = 2a$

10. Simplify the equations you got in 9.

11. Sketch the graph of each ellipse whose equation you found in 9.

12. Given an equation of the hyperbola with the given foci F_1 and F_2. Take the difference of the distances of a point (x, y) on the hyperbola from F_1 and F_2 equal to be d.

   (a) $F_1 = (-2, 0)$ $F_2 = (2, 0)$, $d = 8$
   (b) $F_1 = (-5, 0)$ $F_2 = (5, 0)$, $d = 15$
   (c) $F_1 = (0, -3)$ $F_2 = (0, 3)$, $d = 10$
   (d) $F_1 = (0, -1)$ $F_2 = (0, 1)$, $d = 6$
   (e) $F_1 = (0, -2)$ $F_2 = (0, 3)$, $d = 9$
   (f) $F_1 = (-2, 0)$ $F_2 = (1, 0)$, $d = 5$
   (g) $F_1 = (-2, 3)$ $F_2 = (2, 3)$, $d = 8$
   (h) $F_1 = (-c, 0)$ $F_2 = (c, 0)$, $d = 2a$

13. Simplify the equations you got in 12.

14. Find the equations of the asymptotes of the hyperbolas you found in 12.

15. Sketch the graph of each hyperbola in 12, along with its asymptotes.

16. Give an equation of the parabola with focus the point given and directrix the line with equation given. Simplify the equation.

    (a) $(0, 4)$, $y = -4$
    (b) $(0, -5)$, $y = 5$
    (c) $(2, 4)$, $y = -4$
    (d) $(0, 8)$, $y = -4$
    (e) $(3, 0)$, $x = -3$
    (f) $(5, 0)$, $x = 1$
    (g) $(-2, 2)$, $y = x$
    (h) $(0, 4)$, $y = -4$

17. For each set of coefficient values given below, identify the type of conic section given by the equation $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$. You may need to change the form of the equation to recognize the conic described. Also, there are some "degenerate" cases that do not produce any of the curves we have discussed, and you may see some of them here.

    (a) $A = 1$, $B = 0$, $C = 1$, $D = 0$, $E = 0$, $F = -25$
    (b) $A = 1$, $B = 0$, $C = 2$, $D = 0$, $E = 0$, $F = -2$
    (c) $A = \frac{1}{2}$, $B = 0$, $C = \frac{1}{4}$, $D = 0$, $E = 0$, $F = -1$
    (d) $A = 1$, $B = -\frac{4}{9}$, $C = 1$, $D = 0$, $E = 0$, $F = -1$
    (e) $A = 1$, $B = 0$, $C = 1$, $D = 4$, $E = 6$, $F = 0$
    (f) $A = 1$, $B = 0$, $C = 1$, $D = -8$, $E = -10$, $F = 1$
    (g) $A = 4$, $B = 0$, $C = -1$, $D = 0$, $E = 6$, $F = -1$
    (h) $A = -2$, $B = 0$, $C = 1$, $D = 0$, $E = 0$, $F = -1$
    (i) $A = 1$, $B = 0$, $C = 1$, $D = 0$, $E = 2$, $F = 0$
    (j) $A = 1$, $B = 0$, $C = 1$, $D = 0$, $E = 0$, $F = 1$
    (k) $A = 8$, $B = 0$, $C = 0$, $D = 16$, $E = -12$, $F = 2$

(l) $A = 1$, $B = 2$, $C = 1$, $D = 0$, $E = 0$, $F = 0$

18. For the cases in 17 that do not give any of the conic sections we have defined, describe what the graphs are, and consider what relative positions of the cone and the intersecting plane might result in that type of figure.