13. $2x + y = 5$ **14.** $\left(\dfrac{68}{25}, -\dfrac{49}{25}\right)$ **15.** $m = \dfrac{1}{2}, c = \dfrac{5}{2}$

17. $y - x = 1, \ \sqrt{2}$

Miscellaneous Exercise on Chapter 10

1. (a) 3, (b) ± 2, (c) 6 or 1   **2.** $\dfrac{7\pi}{6}, 1$

3. $2x - 3y = 6, -3x + 2y = 6$ **4.** $\left(0, -\dfrac{8}{3}\right), \left(0, \dfrac{32}{3}\right)$

5. $\left| \text{Cos}\left(\dfrac{\phi - \theta}{2}\right) \right|$ **6.** $x = -\dfrac{5}{22}$ **7.** $2x - 3y + 18 = 0$

8. k^2 square units   **9.** 5   **11.** $3x - y = 7, \ \ x + 3y = 9$

12. $13x + 13y = 6$ **14.** $1 : 2$ **15.** $\dfrac{23\sqrt{5}}{18}$ units

16. The line is parallel to x - axis or parallel to y-axis

17. $x = 1, \ \ y = 1.$ **18.** $(-1, -4).$ **19.** $\dfrac{1 \pm 5\sqrt{2}}{7}$

21. $18x + 12y + 11 = 0$ **22.** $\left(\dfrac{13}{5}, 0\right)$ **24.** $119x + 102y = 125$

EXERCISE 11.1

1. $x^2 + y^2 - 4y = 0$ **2.** $x^2 + y^2 + 4x - 6y - 3 = 0$

3. $36x^2 + 36y^2 - 36x - 18y + 11 = 0$ **4.** $x^2 + y^2 - 2x - 2y = 0$

5. $x^2 + y^2 + 2ax + 2by + 2b^2 = 0$ **6.** $c(-5, 3), r = 6$

7. $c(2, 4), r = \sqrt{65}$ **8.** $c(4, -5), r = \sqrt{53}$ **9.** $c\left(\dfrac{1}{4}, 0\right) ; r = \dfrac{1}{4}$

10. $x^2 + y^2 - 6x - 8y + 15 = 0$ **11.** $x^2 + y^2 - 7x + 5y - 14 = 0$

12. $x^2 + y^2 + 4x - 21 = 0 \ \& \ x^2 + y^2 - 12x + 11 = 0$

13. $x^2 + y^2 - ax - by = 0$ **14.** $x^2 + y^2 - 4x - 4y = 5$
15. Inside the circle; since the distance of the point to the centre of the circle is less than the radius of the circle.

EXERCISE 11.2

1. F (3, 0), axis - x - axis, directrix $x = -3$, length of the Latus rectum $= 12$

2. F (0, $\dfrac{3}{2}$), axis - y - axis, directrix $y = -\dfrac{3}{2}$, length of the Latus rectum $= 6$

3. F (–2, 0), axis - x - axis, directrix $x = 2$, length of the Latus rectum $= 8$
4. F (0, –4), axis - y - axis, directrix $y = 4$, length of the Latus rectum $= 16$

5. F ($\dfrac{5}{2}$, 0) axis - x - axis, directrix $x = -\dfrac{5}{2}$, length of the Latus rectum $= 10$

6. F (0, $\dfrac{-9}{4}$), axis - y - axis, directrix $y = \dfrac{9}{4}$, length of the Latus rectum $= 9$

7. $y^2 = 24x$ **8.** $x^2 = -12y$ **9.** $y^2 = 12x$
10. $y^2 = -8x$ **11.** $2y^2 = 9x$ **12.** $2x^2 = 25y$

EXERCISE 11.3

1. F ($\pm\sqrt{20}$, 0); V ($\pm$ 6, 0); Major axis $= 12$; Minor axis $= 8$, $e = \dfrac{\sqrt{20}}{6}$,

Latus rectum $= \dfrac{16}{3}$

2. F (0, $\pm\sqrt{21}$); V (0, $\pm$ 5); Major axis $= 10$; Minor axis $= 4$, $e = \dfrac{\sqrt{21}}{5}$;

Latus rectum $= \dfrac{8}{5}$

3. F ($\pm\sqrt{7}$, 0); V ($\pm$ 4, 0); Major axis $= 8$; Minor axis $= 6$, $e = \dfrac{\sqrt{7}}{4}$;

Latus rectum $= \dfrac{9}{2}$

4. F $(0, \pm\sqrt{75})$; V $(0,\pm 10)$; Major axis = 20; Minor axis = 10 , $e = \dfrac{\sqrt{3}}{2}$;

    Latus rectum = 5

5. F $(\pm\sqrt{13},0)$; V $(\pm 7, 0)$; Major axis =14 ; Minor axis = 12 , $e = \dfrac{\sqrt{13}}{7}$;

    Latus rectum = $\dfrac{72}{7}$

6. F $(0, \pm10\sqrt{3})$; V $(0,\pm 20)$; Major axis =40 ; Minor axis = 20 , $e = \dfrac{\sqrt{3}}{2}$;

    Latus rectum = 10

7. F $(0, \pm 4\sqrt{2})$; V $(0,\pm 6)$; Major axis =12 ; Minor axis = 4 , $e = \dfrac{2\sqrt{2}}{3}$;

    Latus rectum = $\dfrac{4}{3}$

8. F $\left(0,\pm\sqrt{15}\right)$; V $(0,\pm 4)$; Major axis = 8 ; Minor axis = 2 , $e = \dfrac{\sqrt{15}}{4}$;

    Latus rectum = $\dfrac{1}{2}$

9. F $(\pm\sqrt{5},0)$; V $(\pm 3, 0)$; Major axis = 6 ; Minor axis = 4 , $e = \dfrac{\sqrt{5}}{3}$;

    Latus rectum = $\dfrac{8}{3}$

10. $\dfrac{x^2}{25} + \dfrac{y^2}{9} = 1$ 11. $\dfrac{x^2}{144} + \dfrac{y^2}{169} = 1$ 12. $\dfrac{x^2}{36} + \dfrac{y^2}{20} = 1$

13. $\dfrac{x^2}{9} + \dfrac{y^2}{4} = 1$ 14. $\dfrac{x^2}{1} + \dfrac{y^2}{5} = 1$ 15. $\dfrac{x^2}{169} + \dfrac{y^2}{144} = 1$

16. $\dfrac{x^2}{64} + \dfrac{y^2}{100} = 1$ 17. $\dfrac{x^2}{16} + \dfrac{y^2}{7} = 1$ 18. $\dfrac{x^2}{25} + \dfrac{y^2}{9} = 1$

19. $\dfrac{x^2}{10}+\dfrac{y^2}{40}=1$ **20.** $x^2+4y^2=52$ or $\dfrac{x^2}{52}+\dfrac{y^2}{13}=1$

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EXERCISE 11.4

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1. Foci $(\pm\,5,0)$, Vertices $(\pm\,4,0)$; $e=\dfrac{5}{4}$; Latus rectum $=\dfrac{9}{2}$

2. Foci (0 ± 6), Vertices $(0,\pm 3)$; $e=2$; Latus rectum $=18$

3. Foci $(0,\pm\sqrt{13}\,)$, Vertices $(0,\pm 2)$; $e=\dfrac{\sqrt{13}}{2}$; Latus rectum $=9$

4. Foci $(\pm\,10,0)$, Vertices $(\pm\,6,0)$; $e=\dfrac{5}{3}$; Latus rectum $=\dfrac{64}{3}$

5. Foci $\left(0,\pm\dfrac{2\sqrt{14}}{\sqrt{5}}\right)$, Vertices $\left(0,\pm\dfrac{6}{\sqrt{5}}\right)$; $e=\dfrac{\sqrt{14}}{3}$; Latus rectum $=\dfrac{4\sqrt{5}}{3}$

6. Foci $(0,\pm\sqrt{65}\,)$, Vertices $(0,\pm 4)$; $e=\dfrac{\sqrt{65}}{4}$; Latus rectum $=\dfrac{49}{2}$

7. $\dfrac{x^2}{4}-\dfrac{y^2}{5}=1$ **8.** $\dfrac{y^2}{25}-\dfrac{x^2}{39}=1$ **9.** $\dfrac{y^2}{9}-\dfrac{x^2}{16}=1$

10. $\dfrac{x^2}{16}-\dfrac{y^2}{9}=1$ **11.** $\dfrac{y^2}{25}-\dfrac{x^2}{144}=1$ **12.** $\dfrac{x^2}{25}-\dfrac{y^2}{20}=1$

13. $\dfrac{x^2}{4}-\dfrac{y^2}{12}=1$ **14.** $\dfrac{x^2}{49}-\dfrac{9y^2}{343}=1$ **15.** $\dfrac{y^2}{5}-\dfrac{x^2}{5}=1$

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Miscellaneous Exercise on Chapter 11

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1. Focus is at the mid-point of the given diameter.

2. 2.23 m (approx.)   **3.** 9.11 m (approx.)   **4.** 1.56m (approx.)

5. $\dfrac{x^2}{81}+\dfrac{y^2}{9}=1$ **6.** 18 sq units   **7.** $\dfrac{x^2}{25}+\dfrac{y^2}{9}=1$

8. $8\sqrt{3}a$