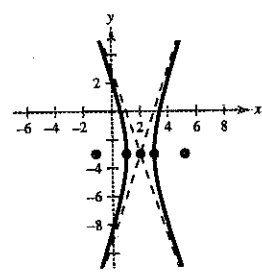


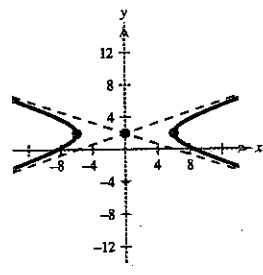
HW textbook p: 720 Hyperbolas (part 2)

15. $9x^2 - y^2 - 36x - 6y + 18 = 0$
 $9(x^2 - 4x + 4) - (y^2 + 6y + 9) = -18 + 36 - 9$
 $\frac{(x-2)^2}{1} - \frac{(y+3)^2}{9} = 1$



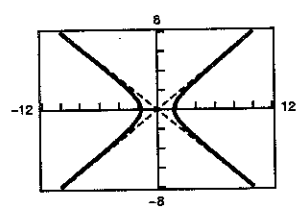
$a = 1, b = 3, c = \sqrt{10}$
 Center: $(2, -3)$
 Vertices: $(1, -3), (3, -3)$
 Foci: $(2 \pm \sqrt{10}, -3)$
 Asymptotes:
 $y = 3x - 9$
 $y = -3x + 3$

16. $x^2 - 9y^2 = 36y - 72 = 0$
 $x^2 - 9(y^2 - 4y + 4) = 72 - 36$
 $x^2 - 9(y-2)^2 = 36$
 $\frac{x^2}{36} - \frac{(y-2)^2}{4} = 1$

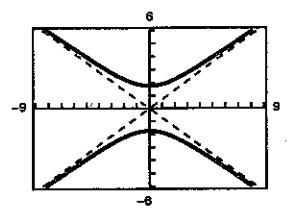


$a = 6, b = 2, c = \sqrt{36 + 4} = 2\sqrt{10}$
 Center: $(0, 2)$
 Vertices: $(\pm 6, 2)$
 Foci: $(\pm 2\sqrt{10}, 2)$
 Asymptotes: $y = 2 \pm \frac{1}{3}x$

19. $2x^2 - 3y^2 = 6$
 $\frac{x^2}{3} - \frac{y^2}{2} = 1$
 $a = \sqrt{3}, b = \sqrt{2}, c = \sqrt{5}$
 Center: $(0, 0)$
 Vertices: $(\pm\sqrt{3}, 0)$
 Foci: $(\pm\sqrt{5}, 0)$
 Asymptotes: $y = \pm\sqrt{\frac{2}{3}}x$



20. $6y^2 - 3x^2 = 18$
 $\frac{y^2}{3} - \frac{x^2}{6} = 1$
 $a = \sqrt{3}, b = \sqrt{6}, c = 3$
 Center: $(0, 0)$
 Vertices: $(0, \pm\sqrt{3})$
 Foci: $(0, \pm 3)$
 Asymptotes: $y = \pm\frac{\sqrt{3}}{\sqrt{6}}x = \pm\frac{\sqrt{2}}{2}x$



$$21. \quad 9y^2 - x^2 + 2x + 54y + 62 = 0$$

$$9(y^2 + 6y + 9) - (x^2 - 2x + 1) = -62 - 1 + 81$$

$$\frac{(y+3)^2}{2} - \frac{(x-1)^2}{18} = 1$$

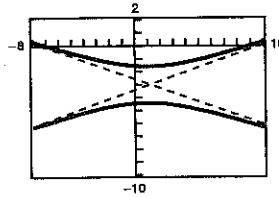
$$a = \sqrt{2}, b = 3\sqrt{2}, c = 2\sqrt{5}$$

Center: $(1, -3)$

Vertices: $(1, -3 \pm \sqrt{2})$

Foci: $(1, -3 \pm 2\sqrt{5})$

Asymptotes: $y = -3 \pm \frac{1}{3}(x - 1)$



$$22. \quad 9x^2 - y^2 = 54x = 10y = 55 = 0$$

$$9(x^2 - 6x + 9) - (y^2 - 10y + 25) = -55 = 81 - 25$$

$$\frac{(x-3)^2}{1/9} - \frac{(y-5)^2}{1} = 1$$

$$a = \frac{1}{3}, b = 1, c = \frac{\sqrt{10}}{3}$$

Center: $(-3, 5)$

Vertices: $(-3 \pm \frac{1}{3}, 5)$

Foci: $(-3 \pm \frac{\sqrt{10}}{3}, 5)$

Asymptotes: $y = 5 \pm 3(x - 3)$

