

1. a. $\frac{(x+1)^2}{49/12} + \frac{(y+\frac{1}{3})^2}{49/3} - \frac{(z+2)^2}{147} = 1$ Hyperboloid in 1 sheets
(see www.scientific-web.com/en/Mathematics/Surfaces/Hyperboloid.html for a picture)
b. translation back 1, left 1/3 and down 2. Dilations
(the following two answers were based on the x and y parts being negative, the z was positive, center is the same)
c. Center: $(-1, -\frac{1}{3}, -2)$, Vertices: $(-1, -\frac{1}{3}, -2 \pm 9)$, Foci: $(-1, -\frac{1}{3}, -2 \pm \sqrt{83.25})$
d. Center: $(-1, -\frac{1}{3}, -2)$, Vertices: $(-1, -\frac{1}{3}, -2 \pm 9)$, Foci: $(-1, -\frac{1}{3}, -2 \pm \sqrt{90})$
2. $x = 4t + 7$, $y = 2t - 3$, $z = 2t + 2$, $t = \frac{2}{3}, \frac{4}{3}$, Intersection points: $(\frac{29}{3}, -\frac{5}{3}, \frac{10}{3})$ and $(\frac{37}{3}, -\frac{1}{3}, \frac{14}{3})$
3. a. Asymptotes: $y + 7 = \pm \frac{3}{2}(x + 3)$, Center: $(-3, -7)$, Vertices: $(-1, -7), (-5, -7)$ Foci: $(-3, -7 \pm \sqrt{13})$
b. Estimate: $y = 518$ and $y = -532$, Exact: $y = 517.9914$ and $y = -531.9914$
c. Start with a 90° rotation or a reflection over $y = x$. You know the rest.
4. Too hard to type...use the hints.
5. a. $x = 5\cos(t) + 1$, $y = 3\sin(t) - 4$
b. $x = 5\cos(-2t) + 1$, $y = 3\sin(-2t) - 4$
c. same ellipse, starts at the top $(1, -1)$ and goes around CW
6. $x = 2\sec(t) - 3$, $y = \tan(t)/3$
Center: $(-3, 0)$, Vertices: $(-3 \pm 2, 0)$, Foci: $(-3 \pm \frac{\sqrt{37}}{3}, 0)$, Asymptotes: $y = \pm \frac{1}{6}(x + 3)$
7. a. Center: $(1, 8)$, Vertices: $(1, 8 \pm \frac{1}{3})$, Foci: $(1, 8 \pm \sqrt{\frac{5}{6}})$, Asymptotes: $y - 8 = \pm \frac{2}{3}(x - 1)$
b. $-4(x - 1)^2 + 9(y - 8)^2 = 1$
8. a. $\frac{(x+4)^2}{9} + \frac{(y+3)^2}{4} = 1$
b. $x = 3\sin(-t/2) - 4$, $y = 2\cos(-t/2) - 3$
9. a. $-\frac{(x+2)^2}{4} + \frac{(y+7)^2}{25} = 1$
b. $x = 2\tan(2t) - 2$, $y = 5\sec(2t) - 7$