32.

For the side of triangle from A to B, use $(x_1, y_1) = (1, 1)$ and $(x_2, y_2) = (4, 2)$. Hence, the equation are

$$x = x_1 + (x_2 - x_1)t = 1 + (4 - 1)t = 1 + 3t,$$

$$y = y_1 + (y_2 - y_1)t = 1 + (2 - 1)t = 1 + t.$$

Graph it. 34.

(a) Let $\frac{x^2}{a^2} = sin^2 t$ and $\frac{y^2}{b^2} = cos^2 t$ to obtain $x = asint$ and $y = bcost$ with $0 \leq t \leq 2\pi$ as possible parametric equations for the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
(b) The equation are $x = 3sint$ and $y = bcost$ for $b \in \{1, 2, 4, 8\}$.
(c) As b increase, the ellipse stretches vertically.

36. If you are using a calculator or computer that can overlay graphs(using multiple $t-$intervals), the following are appropriate.
$Leftside$: $x = 1$ and y goes from 1.5 to 4, so use

$$x = 1, \qquad y = t, \qquad 1.5 \leq t \leq 4$$

$Rightside$: $x = 10$ and y goes from 1.5 to 4, so use

$$x = 10, \qquad y = t, \qquad 1.5 \leq t \leq 4$$

$Bottom$: x goes from 1 to 10 and $y = 1.5$, so use

$$x = t, \qquad y = 1.5, \qquad 1 \leq t \leq 10$$

$Handle$: It starts at (10,4) and ends at (13,7), so use

$$x = 10 + t, \qquad y = 4 + t, \qquad 0 \leq t \leq 3$$

$Leftwheel$:It's centered at (3,1),has radius of 1,and appears to go about $30°$ above the horizontal, so use

$$x = 3 + cost, \qquad y = 1 + sint, \qquad \frac{5\pi}{6} \leq t \leq \frac{13\pi}{6}$$

$Rightwheel$:Similar to the left wheel with center (8,1), so use

$$x = 8 + cost, \qquad y = 1 + sint, \qquad \frac{5\pi}{6} \leq t \leq \frac{13\pi}{6}$$

38.

(a)$x = t$, so $y = t^{-2} = x^{-2}$. We get the entire curve $y = \frac{1}{x^2}$ travesed in a left-to-right direction.

(b) $x = cost$, $y = sec^2 t = \frac{1}{cos^2 t} = \frac{1}{x^2}$. Since $sect \geq 1$, we only get the parts of the curve $y = \frac{1}{x^2}$ with $y \geq 1$. We get the first quadrant portion of the curve when $x > 0$, that is $cost > 0$, and we get the second quadrant portion of the curve when $x < 0$, that is , $cost < 0$.

(c)$x = e^t$, $y = e^{-2t} = x^{-2}$. Since e^t and e^{-2t} are both positive, we only get the first quadrant portion of the curve $y = \frac{1}{x^2}$.

40. The first two diagram depict the case $\pi < \theta < \frac{3\pi}{2}$, $d < r$. As in Example6, C has coordinates $(r\theta, r)$. Now Q(in the second diagram) has coordinates $(r\theta, r + dcos(\theta - \pi)) = (r\theta, r - dcos\theta)$, so a typical point P of the trochoid has coordinates $(r\theta + dsin(\theta - \pi), r - dcos\theta)$. That is, P has coordinates (x, y), where $x = r\theta - dsin\theta$ and $y = r - dcos\theta$. When $d = r$, these equations agree with those of the cycloid.

42.

A has coordinates $(acos\theta, asin\theta)$. Since OA is perpendicular to AB, $\triangle OAB$ is right triangle and B has coordinates $(asec\theta, 0)$. It follows that P has coordinates $(asec\theta, bsin\theta)$. Thus, the parametric equations are $x = asec\theta, y = bsin\theta$.

44.

(a)Let θ be the angle of inclination of segment OP. Then $|OB| = \frac{2a}{cos\theta}$. Let $C = (2a, 0)$. Then by use of triangle OAC we see that $|OA| = 2acos\theta$. Now

$$|OP| = |AB| = |OB| - |OA| = 2a(\frac{1}{cos\theta} - cos\theta) = 2a\frac{1 - cos^2\theta}{cos\theta} = 2a\frac{sin^2\theta}{cos\theta} = 2asin\theta cos\theta.$$

(b) Use the information and graph it.

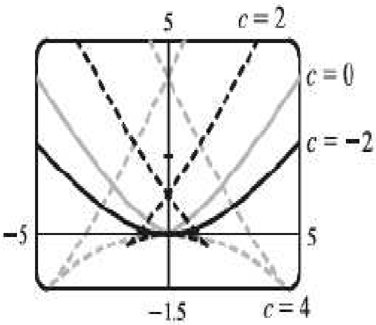
46.

(a) If $\alpha = 30°$ and $v_0 = 500m/s$, then the equations become $x = (500cos30°)t = 250\sqrt{3}t$ and $y = (500sin30°)t - \frac{1}{2}(9.8)t^2 = 250t - 4.9t^2$. $y = 0$ when $t = 0$(when gun is fired) and again when $t = \frac{250}{4.9} \approx 51s$. Then $x = (250\sqrt{3})(\frac{250}{4.9}) \approx$

22092m, so the bullet hits the ground about 22 km from the gun. The formula for y is quadratic in t.

(b) As $\alpha(0^\circ < \alpha < 90^\circ)$ increases up to 45°, the projectile attains a greater height and a greater range. As α increases pass 45°, the projectile attains a greater height, but its range decreases.
(c) $x = (v_0 cos\alpha)t \Rightarrow t = \frac{x}{v_0 cos\alpha}$. So $y = (v_0 sin\alpha)t - \frac{1}{2}gt^2 \Rightarrow y = (v_0 sin\alpha)\frac{x}{v_0 cos\alpha} - \frac{g}{2}(\frac{x}{v_0 cos\alpha})^2 = (tan\alpha)x - (\frac{g}{2v_0^2 cos^2\alpha})x^2$ which is the equation of a parabola (quadratic in x).

48.



$x = 2ct - 4t^3,\ y = -ct^2 + 3t^4$. We use a graphing device to produce the graphs for various values of c with $-\pi \le t \le \pi$.
50. Use computer devices to plot some cases and observe their behavior.