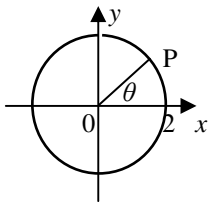
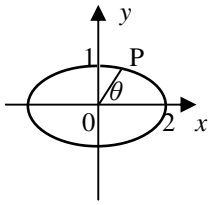
= Year 12 **= Vectors** **= Worksheet 4**

1. Determine the cartesian equation corresponding to the vector equation $\mathbf{a} = \frac{\theta}{2}\mathbf{i} + \left(\frac{\theta}{3} - 1\right)\mathbf{j}$.	2. In terms of θ, find a vector equation of the locus of point P, which is the circle as shown. 
3. Determine the cartesian equation corresponding to the vector equation $\mathbf{b} = (p-1)\mathbf{i} + (1-p^2)\mathbf{j}$.	4. In terms of θ, find a vector equation of the locus of point P, which is the ellipse as shown. 
5. Refer to Q4. If $\theta = \frac{t}{2} - 1$ at time t, find a vector equation of the locus of point P in terms of t.	6. Derive the cartesian equation of the path given by $\mathbf{r}(t) = \frac{1}{t+1}\mathbf{i} - (t-1)\mathbf{j}$.
7. Derive the cartesian equation of the path given by $\mathbf{r}(t) = \left(t + \frac{1}{t}\right)\mathbf{i} + \left(t - \frac{1}{t}\right)\mathbf{j}$.	8. Derive the cartesian equation of the path given by $\mathbf{r}(t) = \left(t^2 + \frac{1}{t^2}\right)\mathbf{i} + \left(t^2 - \frac{1}{t^2}\right)\mathbf{j}$.
9. What is different between the particle motions in Q7 and Q8?	10. Derive the cartesian equation of the path given by $\mathbf{r}(t) = 2\sec(2t)\mathbf{i} - \tan(2t)\mathbf{j}$.
11. Derive the cartesian equation of the path given by $\mathbf{r}(t) = \frac{2t}{\sqrt{1+t^2}}\mathbf{i} - \frac{3}{\sqrt{1+t^2}}\mathbf{j}$.	Numerical, algebraic and worded answers. 1. $y = 2/3\,x - 1$ 2. $\mathbf{r} = 2\cos\theta\,\mathbf{i} + 2\sin\theta\,\mathbf{j}$ 3. $y = -x^2 + 2x$ 4. $\mathbf{r} = 2\cos\theta\,\mathbf{i} + \sin\theta\,\mathbf{j}$ 5. $\mathbf{r} = 2\cos(t/2 - 1)\,\mathbf{i} + \sin(t/2 - 1)\,\mathbf{j}$ 6. $y = 2 - 1/x$ 7. $x^2 - y^2 = 4$ 8. $x^2 - y^2 = 4$ 9. Same path but different velocity 10. $x^2/4 - y^2 = 1$ 11. $x^2/4 + y^2/9 = 1$