Curves Defined By Parametric Equations.

Section 10.1 - Stewart 7th ed.

Figure 7

```
r = 0.2;

x1[t_] = t + 2 Sin[2 t];
y1[t_] = t + 2 Cos[5 t];
PATH1 =
   ParametricPlot[{x1[t], y1[t]}, {t, -2 π, 2 π}, PlotRange → {{-6.5, 6.5}, {-8, 8}}];
Manipulate[Show[{PATH1, Graphics[Disk[{x1[t], y1[t]}, r]]}, AspectRatio → 1],
   {t, -2 π, 2 π, π/50}]
```
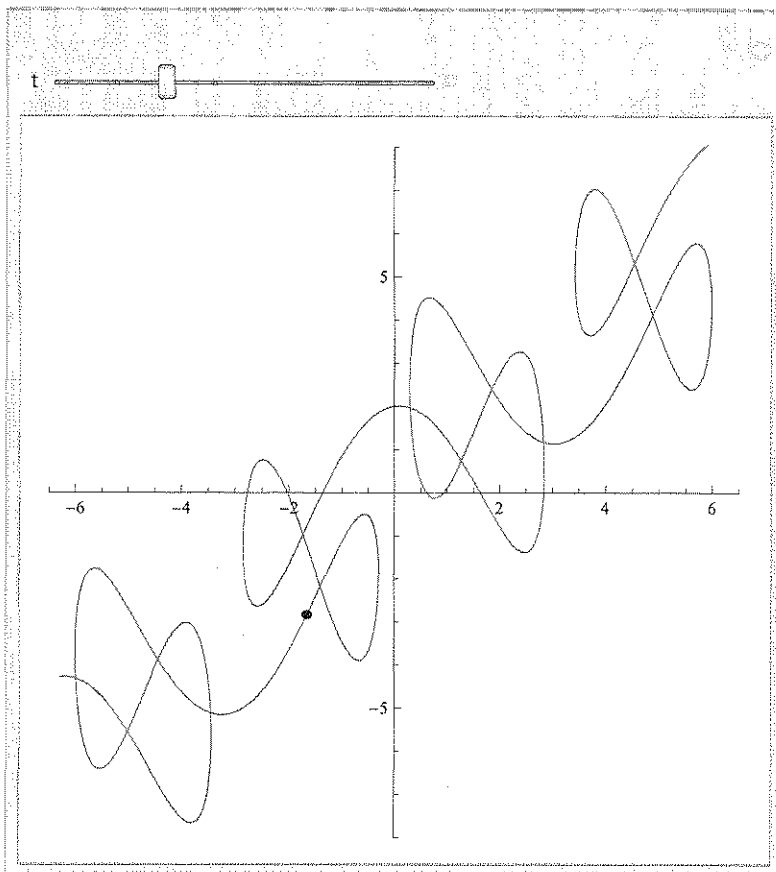
Out[9]=

Figure 12

In[9]:= `r = 0.05;`

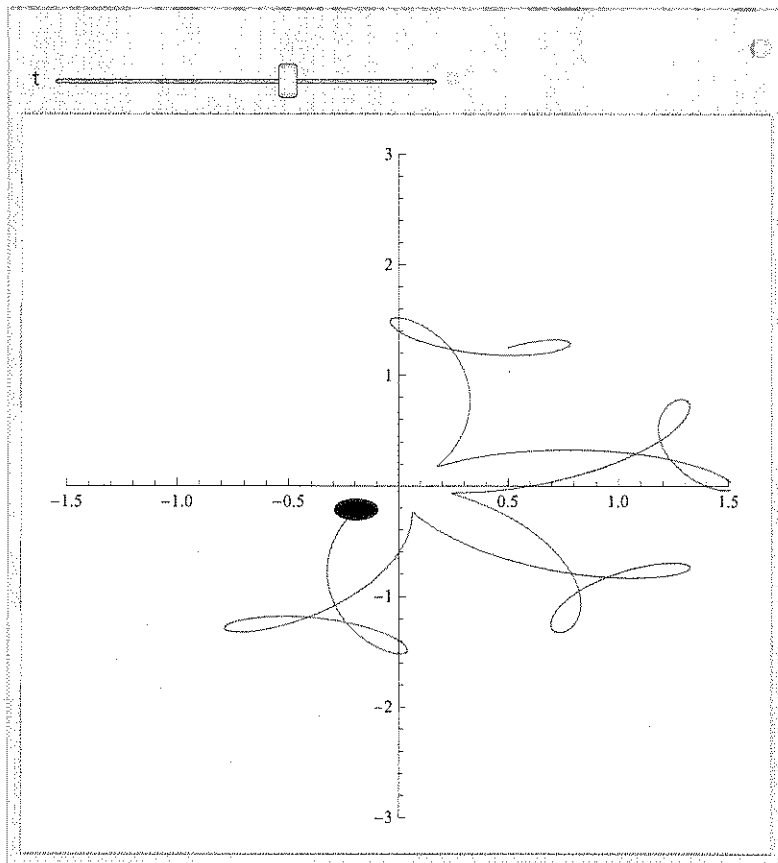$$x2[t\_] = Sin[t] + \frac{1}{2} Cos[5\,t] + \frac{1}{4} Sin[13\,t];$$

$$y2[t\_] = Cos[t] + \frac{1}{2} Sin[5\,t] + \frac{1}{4} Cos[13\,t];$$

```
PATH2 = ParametricPlot[{x2[t], y2[t]}, {t, -2 π, 2 π},
    PlotRange → {{-1.5, 1.5}, {-3, 3}}, PlotPoints → 100];
```

```
PATH3[T_] := ParametricPlot[{x2[t], y2[t]}, {t, 0, T+0.00001},
    PlotRange → {{-1.5, 1.5}, {-3, 3}}, PlotPoints → 100];
```

$$\text{Manipulate}\Big[\text{Show}[\{PATH3[t], Graphics[Disk[\{x2[t], y2[t]\}, r]]\}, AspectRatio → 1],$$
$$\Big\{t, 0, 2\,\pi, \frac{\pi}{1000}\Big\}\Big]$$

Out[14]=

Example 7: The Cycloid

```
In[15]:= r = .1;
        R = 1;

        x3[t_] = R (t - Sin[t]);
        y3[t_] = R (1 - Cos[t]);

        PATH4[T_] :=
          ParametricPlot[{x3[t], y3[t]}, {t, 0, T + 0.00001}, PlotRange → {{0, 6 π}, {-1, 5}}];

        Manipulate[
          Show[{PATH4[t], Graphics[{Disk[{x3[t], y3[t]}, r], Circle[{R t, R}, {R, R}],
              Line[{{R t, R}, {x3[t], y3[t]}}]}]}, AspectRatio → .31], {t, 0, 6 π, π/10}]
```
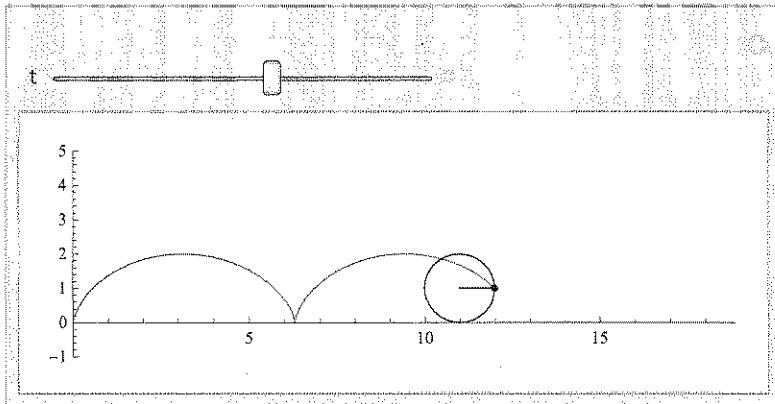
Out[20]=

Example 8: Conchoids of Nicomedes

```mathematica
In[21]:= Manipulate[
  Show[{
    ParametricPlot[{a + Cos[t], a Tan[t] + Sin[t]},
      {t, -π, -π/2 - .0001}, PlotRange → {{-4, 4}, {-4, 4}}],
    ParametricPlot[{a + Cos[t], a Tan[t] + Sin[t]},
      {t, -π/2 + .0001, π/2 - .0001}, PlotRange → {{-4, 4}, {-4, 4}}],
    ParametricPlot[{a + Cos[t], a Tan[t] + Sin[t]},
      {t, π/2 + .0001, π}, PlotRange → {{-4, 4}, {-4, 4}}]
  }],
  {a, -2, 2, 0.1}]
```

Out[21]=