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In[876]:= x = Cos[3 π t] / 5;
          y = 0.4 Sin[3 π t];
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In[878]:= Vx = D[x, {t, 1}]; Print["Vx = ", Vx];
          Vy = D[y, {t, 1}]; Print["Vy = ", Vy];
          V = Sqrt[Vx^2 + Vy^2] // Simplify;
          Print["V = ", V];
```

$$V_x = -\frac{3}{5} \pi \sin[3 \pi t]$$

$$V_y = 3.76991 \cos[3 \pi t]$$

$$V = \sqrt{14.2122 \cos^2[3 \pi t] + 3.55306 \sin^2[3 \pi t]}$$

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In[881]:= Wx = FullSimplify[D[x, {t, 2}]]; Print["Wx = ", Wx];
          Wy = D[y, {t, 2}]; Print["Wy = ", Wy];
          W = Sqrt[(Wx^2 + Wy^2) // Expand // FullSimplify];
          Print["W = ", W];
```

$$W_x = -\frac{9}{5} \pi^2 \cos[3 \pi t]$$

$$W_y = -35.5306 \sin[3 \pi t]$$

$$W = \sqrt{789.014 - 473.408 \cos[6 \pi t]}$$

```
In[884]:= Wτ = (Vx + Wx + Vy + Wy) // FullSimplify // FullSimplify;
          Sqrt[Vx^2 + Vy^2]
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Print["Wτ = ", Wτ];
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Wn = Sqrt[W^2 - Wτ^2] // FullSimplify; Print["Wn = ", Wn];
```

```
ρ = V^2 // Simplify; Print["ρ = ", ρ];
Wn
```

$$W_\tau = \frac{-13.9954 \cos[3 \pi t] - 37.4155 \sin[3 \pi t]}{\sqrt{8.88264 + 5.32959 \cos[6 \pi t]}}$$

$$W_n = \sqrt{\left(928.608 + 112.959 \cos[6 \pi t] - 236.704 \cos[12 \pi t] - 98.2524 \sin[6 \pi t]\right) / (1.66667 + 1. \cos[6 \pi t])}$$

$$\rho = \frac{14.2122 \cos^2[3 \pi t] + 3.55306 \sin^2[3 \pi t]}{\sqrt{\frac{928.608 + 112.959 \cos[6 \pi t] - 236.704 \cos[12 \pi t] - 98.2524 \sin[6 \pi t]}{1.66667 + 1. \cos[6 \pi t]}}}$$

```

In[888]:= Vxt = Vx /. t ->  $\frac{1}{6}$  // N; Print["(при t =  $\frac{1}{6}$ ): Vx = ", Vxt];
Vyt = Vy /. t ->  $\frac{1}{6}$  // N; Print["(при t =  $\frac{1}{6}$ ): Vy = ", Vyt];
Wxt = Wx /. t ->  $\frac{1}{6}$  // N; Print["(при t =  $\frac{1}{6}$ ): Wx = ", Wxt];
Wyt = Wy /. t ->  $\frac{1}{6}$  // N; Print["(при t =  $\frac{1}{6}$ ): Wy = ", Wyt];
Vt = V /. t ->  $\frac{1}{6}$  // N; Print["(при t =  $\frac{1}{6}$ ): V = ", Vt];
Wt = W /. t ->  $\frac{1}{6}$  // N; Print["(при t =  $\frac{1}{6}$ ): W = ", Wt];
Wnt = Wn /. t ->  $\frac{1}{6}$  // N; Print["(при t =  $\frac{1}{6}$ ): Wn = ", Wnt];
W $\tau$ t = W $\tau$  /. t ->  $\frac{1}{6}$  // N; Print["(при t =  $\frac{1}{6}$ ): W $\tau$  = ", W $\tau$ t];
 $\rho$ t =  $\rho$  /. t ->  $\frac{1}{6}$  // N; Print["(при t =  $\frac{1}{6}$ ):  $\rho$  = ",  $\rho$ t];

```

(при t =  $\frac{1}{6}$ ): Vx = -1.88496

(при t =  $\frac{1}{6}$ ): Vy = -1.88496

(при t =  $\frac{1}{6}$ ): Wx = 0.

(при t =  $\frac{1}{6}$ ): Wy = -35.5306

(при t =  $\frac{1}{6}$ ): V = 1.88496

(при t =  $\frac{1}{6}$ ): W = 35.5306

(при t =  $\frac{1}{6}$ ): Wn = 29.4689

(при t =  $\frac{1}{6}$ ): W $\tau$  = -19.8496

(при t =  $\frac{1}{6}$ ):  $\rho$  = 0.12057

```

In[897]:= points = {};
xt = x /. t -> 0 // N; yt = y /. t -> 0 // N;
AppendTo[points, {xt, yt}];
Print["M0: (t=0): x = ", xt, "; y = ", yt];
xt = x /. t ->  $\frac{1}{30}$  // N; yt = y /. t ->  $\frac{1}{30}$  // N;
AppendTo[points, {xt, yt}];
Print["M1: (t= $\frac{1}{30}$ ): x = ", xt, "; y = ", yt];
xt = x /. t ->  $\frac{1}{24}$  // N; yt = y /. t ->  $\frac{1}{24}$  // N;
AppendTo[points, {xt, yt}];
Print["M2: (t= $\frac{1}{24}$ ): x = ", xt, "; y = ", yt];
xt = x /. t ->  $\frac{1}{18}$  // N; yt = y /. t ->  $\frac{1}{18}$  // N;
AppendTo[points, {xt, yt}];
Print["M3: (t= $\frac{1}{18}$ ): x = ", xt, "; y = ", yt];
xt = x /. t ->  $\frac{1}{12}$  // N; yt = y /. t ->  $\frac{1}{12}$  // N;
AppendTo[points, {xt, yt}];
Print["M4: (t= $\frac{1}{12}$ ): x = ", xt, "; y = ", yt];
xt = x /. t ->  $\frac{1}{6}$  // N; yt = y /. t ->  $\frac{1}{6}$  // N;
AppendTo[points, {xt, yt}];
Print["M5: (t= $\frac{1}{6}$ ): x = ", xt, "; y = ", yt];

```

M<sub>0</sub>: (t=0): x = 0.2; y = 0.

M<sub>1</sub>: (t= $\frac{1}{30}$ ): x = 0.190211; y = 0.123607

M<sub>2</sub>: (t= $\frac{1}{24}$ ): x = 0.184776; y = 0.153073

M<sub>3</sub>: (t= $\frac{1}{18}$ ): x = 0.173205; y = 0.2

M<sub>4</sub>: (t= $\frac{1}{12}$ ): x = 0.141421; y = 0.282843

M<sub>5</sub>: (t= $\frac{1}{6}$ ): x = 0.; y = 0.4

```
In[916]:= ParametricPlot[{Cos[3  $\pi$  t] / 5, 0.4 Sin[3  $\pi$  t]},  
  {t, 0,  $\frac{1}{6}$ }, AxesLabel → {"x", "y"}, PlotLegends → "Expressions"]
```

