

Harj. 2, teht. 15

Mat ohj., kevat 2013, HA

```
> restart
```

```
> ode1 := diff(x(t), t) = -sigma·x(t) + rho·y(t)
```

$$\text{ode1} := \frac{d}{dt} x(t) = -\sigma x(t) + \rho y(t) \quad (1)$$

```
> ode2 := diff(y(t), t) = sigma·x(t) - y(t) - x(t)·z(t)
```

$$\text{ode2} := \frac{d}{dt} y(t) = \sigma x(t) - y(t) - x(t) z(t) \quad (2)$$

```
> ode3 := diff(z(t), t) = -beta·z(t) + x(t)·y(t)
```

$$\text{ode3} := \frac{d}{dt} z(t) = -\beta z(t) + x(t) y(t) \quad (3)$$

```
> sigma := 10; rho := 28; beta := 8/3
```

$$\sigma := 10$$

$$\rho := 28$$

$$\beta := \frac{8}{3} \quad (4)$$

```
> ans := dsolve({ode1, ode2, ode3, x(0) = 1.0, y(0) = 1.0, z(0) = 1.0}, {x(t), y(t), z(t)},  
numeric, range = 0 .. 40)
```

```
ans := proc(x_rkf45) ... end proc \quad (5)
```

```
> with(plots) :
```

```
> curvex := odeplot(ans, [t, x(t)], refine = 2)
```

```
curvex := PLOT(...) \quad (6)
```

```
> curvey := odeplot(ans, [t, y(t)], refine = 2, color = green)
```

```
curvey := PLOT(...) \quad (7)
```

```
> curvez := odeplot(ans, [t, z(t)], refine = 2, color = blue)
```

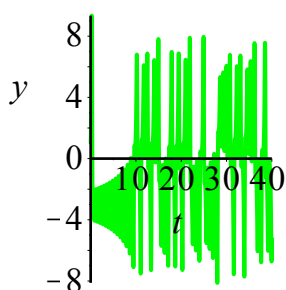
```
curvez := PLOT(...) \quad (8)
```

```
> #?document mode
```

```
display(curvex)
```

```
> display(curvex)
```

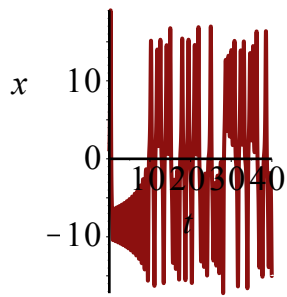
```
> display(curvey)
```



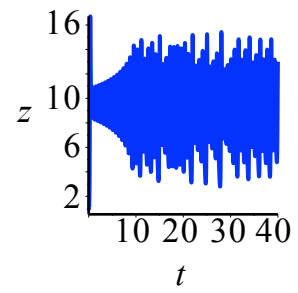
```
>
```

```
display(curvez)
```

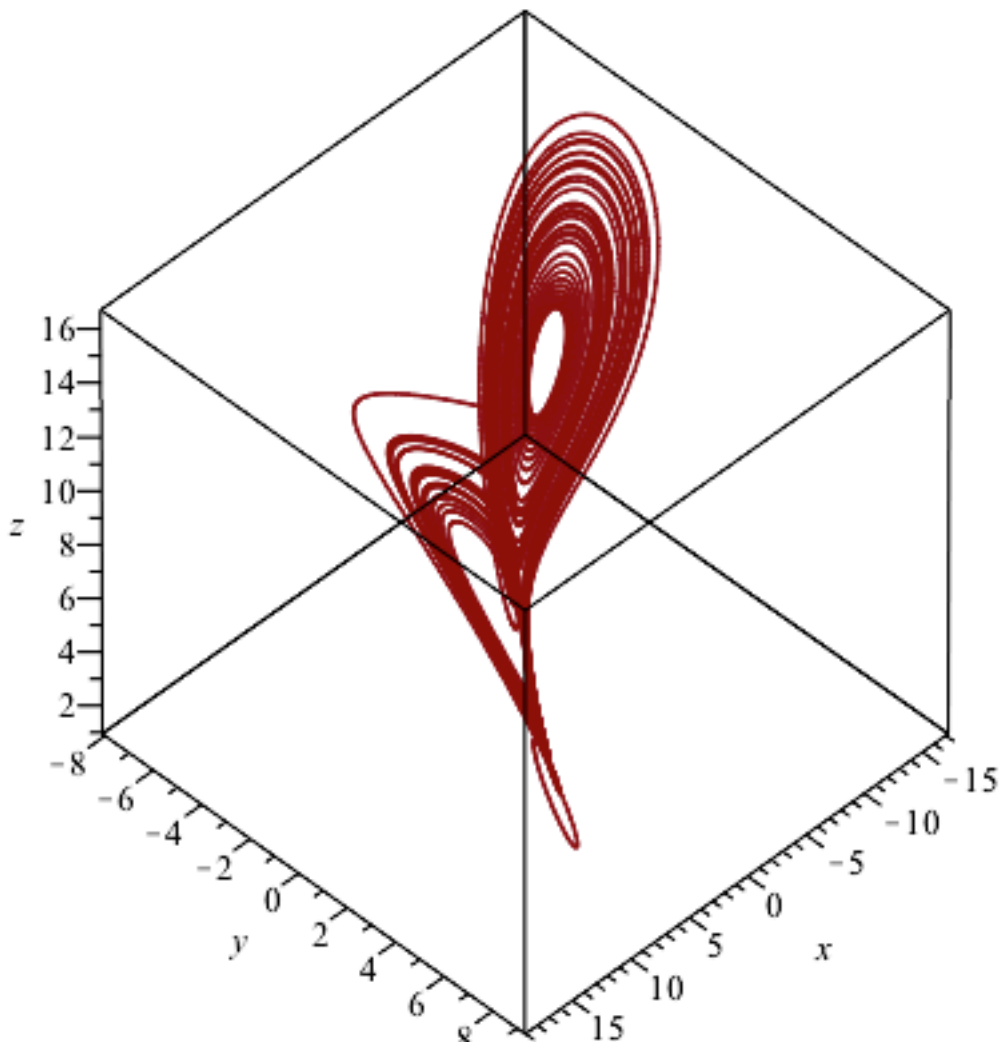
```
> display(curvez)
```



```
>  
display(curvey)
```



```
>  
> odeplot(ans, [x(t), y(t), z(t)], t=0 ... 40, refine = 3, axes = box)
```



```
>  
>
```