

Math 308 · Maple Quiz 1 · Summer 2003

Sec 301,302 · Version A

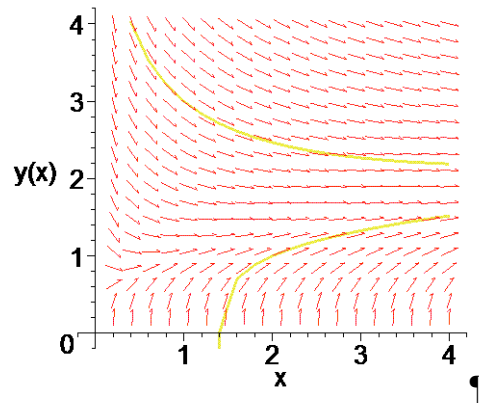
```
> restart; with(DEtools):
```

```
#1
```

```
> deq:=diff(y(x),x)=(2*x-y(x)^3)/(3*x*y(x)^2);
```

$$deq := \frac{d}{dx} y(x) = \frac{1}{3} \frac{2x - y(x)^3}{x y(x)^2}$$

```
> DEplot(deq, y(x), x=0..4, y=0..4, [[2,1],[1,3]]);
```



```
#2
```

```
> F:=(x,y)->(2*x-y^3)/(3*x*y^2);
```

$$F := (x, y) \rightarrow \frac{1}{3} \frac{2x - y^3}{x y^2}$$

```
> h:=.2;
```

$$h := 0.2$$

```
> xs[0]:=2;ys[0]:=1;
```

$$xs_0 := 2$$

$$ys_0 := 1$$

```
> for i from 1 to 10 do
```

```
  xs[i]:=xs[i-1]+h;
```

```
  ys[i]:=ys[i-1]+F(xs[i-1],ys[i-1])*h;
```

```
end do;
```

$$xs_1 := 2.2$$

$$ys_1 := 1.100000000$$

$$xs_2 := 2.4$$

$$ys_2 := 1.176859504$$

$$xs_3 := 2.6$$

$$ys_3 := 1.240438636$$

$$xs_4 := 2.8$$

```

ys4 := 1.295286428
xs5 := 3.0
ys5 := 1.343916987
xs6 := 3.2
ys6 := 1.387875532
xs7 := 3.4
ys7 := 1.428182431
xs8 := 3.6
ys8 := 1.465547782
xs9 := 3.8
ys9 := 1.500486159
xs10 := 4.0
ys10 := 1.533382706

```

```
#3
```

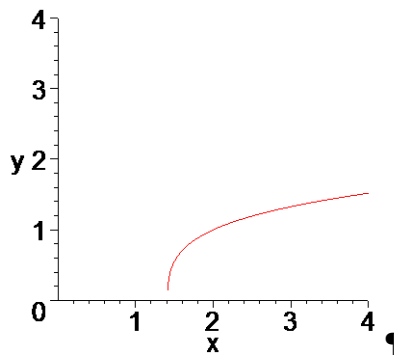
```
> init := y(2) = 1;
```

```
init := y(2) = 1
```

```
> sol := dsolve({deq, init}, y(x));
```

$$sol := y(x) = \frac{((x^2 - 2)x^2)^{(1/3)}}{x}$$

```
> plot(rhs(sol), x=0..4, y=0..4);
```



```
> subs(x=4, rhs(sol)); evalf(%);
```

$$\frac{224^{(1/3)}}{4}$$

1.518294486

```
#4
```

The Euler approximation 1.533 is bigger than the exact value 1.518 because the solution is concave down so the tangent lines are always above the curve.